DOCUMENT RESUME

ED 428 516 EF 005 255

AUTHOR	Morrison, Melaine L.; Fise, Mary Ellen
TITLE	Report and Model Law on Public Play Equipment and Areas. Third Edition.
INSTITUTION	Consumer Federation of America, Washington, DC.
PUB DATE	1998-00-00
NOTE	203p.
AVAILABLE FROM	Consumer Federation of America, 1424 16th St. NW, Washington, DC 20036; Tel: 202-387-6121.
PUB TYPE	Guides - Non-Classroom (055)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Elementary Education; Guidelines; *Playgrounds; Preschool Education; *Safety
IDENTIFIERS	Americans with Disabilities Act 1990; Child Safety; *Playground Design; *Playground Equipment

ABSTRACT

Advocates for safer playgrounds need to make informed decisions when purchasing play equipment and designing play areas. This updated document provides safety and design criteria in the form of model law provisions that can be used by those responsible for playground development. It reports on injury data which establish common injury scenarios for both younger and older children; and discusses critical developmental issues that affect playground safety, including how children's capabilities and limitations at different ages relate to their play and injury patterns. Additionally provided are the requirements applicable to all play areas and equipment for children ages 2 through 5 years and 5 through 12 years. Final sections of the report present a discussion of playgrounds and compliance with the Americans with Disabilities Act (it does not provide design recommendations for how to comply with the law), and lists references and major sources of playground safety information and available resources. Appendices include Consumer Product Safety Commission (CPSC) Safety Alert and CPSC Notices of Recalls, and a revised Consumer Federation of America Parent Checklist itemizing the 12 common hazards that parents and others can use to check the safety of their local playgrounds. (Contains 39 references.) (GR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

Consumer Federation of America

ED 428 516

Report and Model Law

on

Public Play Equipment and Areas

Melanie L. Morrison

and

Mary Ellen Fise

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
X This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Third Edition

1998

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY
Mary Ellen Fise
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
2B

© 1998 Consumer Federation of America
All Rights Reserved

BEST COPY AVAILABLE

EF 005 255

1424 16th Street, N.W., Suite 604 • Washington, D.C. 20036 • (202) 387-6121

Author Notes

Melanie L. Morrison is an advocate for children, working to improve the quality of environments in which children play, learn, and grow. Her goals are to reduce childhood injuries and to increase the availability of developmentally appropriate programs for all children. Ms. Morrison serves as a technical consultant to Consumer Federation of America. She has a Bachelor of Science degree in Human Factors Engineering from Tufts University and a Master of Arts degree in Child Development from the University of Maryland.

Mary Ellen Fise is General Counsel and Product Safety Director of Consumer Federation of America, a national non-profit consumer advocacy group. Ms. Fise represents consumers before the Congress and the U. S. Consumer Product Safety Commission (CPSC), as well as other health and safety agencies. She is co-author of *The Childwise Catalog: A Consumer Guide to Buying the Safest and Best Products for Your Children* (3rd Edition, HarperCollins, 1993). She has a Bachelor of Science degree in Consumer Economics from the University of Maryland and a law degree from the University of Baltimore.

Acknowledgments

This document is based primarily on research that Ms. Morrison conducted with former colleagues at Comsis Corporation, under contract to the CPSC, to examine playground equipment safety and design (Ratté, Morrison, and Lerner, 1990). It is also based in large part on various CPSC reports, including studies of playground injuries (Tinsworth and Kramer, 1990), studies of playground surfacing materials (Collantes, 1990; CPSC, 1990; Ramsey and Preston, 1990), and the *Handbook for Public Playground Safety* (CPSC, 1991, 1994, 1997).

The authors would like to thank John Preston of the CPSC and Susan DeFrancesco of Injury Prevention Works for their help on this project and for their many other important contributions toward improving playground safety. We also appreciated the advice and suggestions of Jay Beckwith and Betsy Caeser.

Report and Model Law

on

Public Play Equipment and Areas

Third Edition

1998

Important Note:

Consumer Federation of America (CFA) originally published the First Edition of its *Report and Model Law on Public Play Equipment and Areas* in 1992. A Second Edition was released in 1996 to update and expand the original document. At that time, changes and additions were necessary due to the continued high rates of injuries on public playgrounds, new information, and an increased understanding of how children suffer playground injuries. To stay current, CFA believes another revision to its report is warranted now.

This new Third Edition of CFA's a *Report and Model Law on Public Play Equipment and Areas* incorporates changes and additions to CPSC's *Handbook for Public Playground Safety*, a new printing of which was released in November, 1997. As in past years, CFA's goal with its revisions is to ensure that there are again no conflicts between the current CFA and CPSC documents. Some of the more significant changes and additions include revised requirements on fall (use) zones for protective surfacing under and around equipment, new criteria and test procedures for protrusions and projections to help eliminate entanglement hazards, updates to tables and figures, and safety alerts to highlight the most dangerous playground problems. An effort was also made in the Third Edition to expand the rationale that CFA provides for the safety criteria throughout the report.

Please refer to the new introduction for a more thorough discussion of the report contents and how best to use the information provided herein to improve playground safety and prevent injuries.

Table of Contents

		Pages
Section 1:	Introduction	1-7
Section 2:	Playground Injuries	8-11
Section 3:	Developmental Issues for Playground Designers	12-23
Section 4:	Safety and Design Requirements for ALL Play Areas	24-80
Section 5:	Safety and Design Requirements for PRESCHOOL-AGE Play Areas	80-130
Section 6:	Safety and Design Requirements for SCHOOL-AGE Play Areas	130-180
Section 7:	Compliance with the Americans with Disabilities Act	181-183
Section 8:	References	184-186
Section 9:	Playground Safety Resources	187-189
Appendix A:	CPSC Safety Alerts and CPSC Notices of Recalls	
Appendix B:	CFA Parent Checklist	

Section 1

INTRODUCTION

Consumer Federation of America (CFA) originally published its *Report and Model Law on Public Play Areas and Equipment* in 1992. Unfortunately, dangerous playgrounds continue to threaten children's safety across the United States, and the rates of injury that children suffer on public playgrounds remain alarmingly high. Now in its Third Edition, this report provides a significant update and expansion of the original document. CFA believes this revision is necessary to convey the most current safety information and a more complete understanding of how children get hurt on playgrounds and playground equipment.

An estimated 150,000 children are treated in emergency rooms for injuries related to public playground equipment annually, according to the U. S. Consumer Product Safety Commission (CPSC) -- the federal agency charged with oversight of playground safety. The CPSC also estimates that at least 15 children die each year as a result of playground-related incidents. We must bring these numbers down.

Although the federal government has long studied playground injuries and is fully aware of the magnitude of the problem, the CPSC offers only voluntary guidelines. There are no mandatory standards for the design and construction of outdoor play equipment intended for public use in this country.

The CPSC first published their voluntary guidelines, the *Handbook for Public Playground Safety*, in 1981. Based on an extensive research study done by Comsis Corporation under contract to the CPSC, a new handbook was published in 1991. That handbook was subsequently re-issued in 1994 following a small set of changes. In November 1997, CPSC recently re-issued the handbook after making a more significant set of changes. CPSC's publications have always provided useful information, and each revision to their handbook has improved and expanded their recommendations.

Twenty years have passed since CPSC first began addressing the issue of playground safety, yet reported injury rates are much higher. CPSC data for 1977 indicated that approximately 93,000 children received emergency room treatment for playground-related injuries; that number has grown to approximately 150,000 each year. Even worse, preventable deaths continue to occur.

The CPSC handbooks have done a great deal to educate consumers as well as manufacturers of playground equipment over the years. However, it is clear that while voluntary compliance with the CPSC *Handbook for Public Playground Safety* is a good start, it is not enough to reduce injury rates and save lives. More must be done.

Our children deserve a higher level of protection against injury and death on their playgrounds. We need increased action by policy makers, including the CPSC, to address this problem. That is why CFA originally published its *Report and Model Law on Public Play Equipment and Areas* and has now released an updated and expanded Third Edition.

The good news is that playground safety is getting more and more attention each year. Numerous journal articles and books have been published. Newspaper and magazine articles appear

frequently. Research studies and special conferences are being dedicated to understanding and preventing playground injuries.

Moreover, advocacy efforts are paying off. State laws to regulate the safety of public playgrounds and equipment have passed in California, Connecticut, and Texas. Legislation has also been introduced in New Mexico, Oklahoma, and Pennsylvania. Legislators in New Jersey are now reviewing the issue. Other states are promulgating new playground safety regulations through the authority of various agencies, such as the state health departments in Colorado and Arkansas and the child care licensing authorities in North Carolina.

The issue has also been addressed successfully at the local level. In Pittsburgh, Pennsylvania, for example, a city ordinance was passed that requires safety inspections and renovations of existing playgrounds and compliance with mandatory safety standards for new playgrounds. The original CFA *Report and Model Law on Public Play Equipment and Areas* provided the basis for this ordinance. In Anchorage, Alaska, the Alaska Public Interest Research Group convinced a new mayoral administration to remove unsafe playground equipment immediately even though new equipment would not be installed for several months. This locality decided that no play equipment was better than life-threatening play equipment.

Another major step forward on the national level was the publication of a voluntary standard by ASTM, which is a private membership standards development organization. This standard (*ASTM F1487-95: Standard Consumer Safety Performance Specification for Playground Equipment for Public Use*) was first published in 1993 and was revised and re-issued in 1995.

Compared to the CPSC handbook, the ASTM voluntary standard is a more detailed document and is intended for manufacturers rather than consumers. The ASTM voluntary standard addresses some but not all of the same issues as the CPSC handbook. Consumers should be aware that there are conflicts between these two documents. The 1997 revisions to the CPSC handbook were, in part, an effort to harmonize CPSC recommendations with the ASTM specifications. However, some differences still remain. A playground or piece of playground equipment could comply with all of the safety guidelines of the 1997 CPSC handbook but not the 1995 ASTM voluntary standard and vice versa. At the time of this printing, further efforts to harmonize the CPSC and ASTM safety guidelines were on-going. This may result in the publication of a North American Standard that reflects both the CPSC and ASTM documents as well as the Canadian standard.

Strong advocacy efforts have helped bring significant changes in the playground industry. Most of the equipment being sold today is significantly safer than what was available just five years ago, with improvements in design, quality, and durability. American manufacturers have also been affected by foreign standards -- including those in Canada, Great Britain, and Germany -- and most have made increased efforts to comply with CPSC's and ASTM's voluntary guidelines. The result is that new playgrounds being constructed today are much safer.

So now the bad news. Most older playgrounds and even some that are only several years old fail to meet even the most basic safety guidelines -- leaving children vulnerable to potentially life-threatening hazards. Greater attention must be focused on renovating existing playgrounds, especially the removal of unsafe equipment and installation of protective surfacing.

In addition to publishing and disseminating the *Report and Model Law on Public Play Equipment and Areas*, CFA has worked with its state and local organizations, including many PIRG groups, to survey playground safety nationwide. The first "Playing it Safe" survey was conducted in 1992 and included 130 playgrounds in 11 states plus the District of Columbia (Sikes, Fise, and Morrison, 1992). The second survey was conducted in 1994 and included 443 playgrounds in 22 states plus the District of Columbia (Wood, Fise, and Morrison, 1994). The third survey was conducted in 1996 and included 562 playgrounds in 25 states plus the District of Columbia (Mierzwinski, Fise, and Morrison, 1996). The fourth survey was just completed in May, 1998 and included 760 playgrounds in 24 states plus the District of Columbia (Mierzwinski, Fise, and Morrison, 1998).

The CFA/PIRG "Playing it Safe" surveys examined the playground hazards known to cause the most serious injuries and death. Although the surveys document some improvement over time, overall the data show that playgrounds are still far from safe and some of the results are frightening.

The 1998 CFA/PIRG data report, for example, an increase in the number of playgrounds with synthetic surfaces as well as an increase in the number of playground with loose-fill surfaces to help protect against fall injuries. There was also a slight decline in 1998 in the number of playgrounds with hard surfaces -- such as concrete, asphalt, dirt or grass -- under and around all play equipment, continuing the improvement on this survey item since the first CFA/PIRG survey (8% in 1998 down from 31% in 1992). These figures are encouraging because more of the playgrounds surveyed are making an effort to provide protective surfacing. However, because so many of playgrounds have mixed surfaces (e.g., some hard surfaces and some protective surfaces) or an inadequate depth of loose-fill materials, 87% of the 760 playgrounds in 1998 surveyed still do not provide protective surfacing that meets the safety criteria for resiliency -- and this figure is much too high. Falls are the most common cause of playground injuries and a known cause of playground fatalities. We know that providing protective surfacing to cushion falls can prevent or at least reduce the severity of fall injuries.

Two other known causes of playground-equipment related death are head entrapment and clothing entanglement. The 1998 CFA/PIRG survey again found improvement but still an unacceptable number of these hazards. Head entrapment hazards were found on 42% of the playgrounds surveyed in 1998 (down from 46% in 1996). Clothing entanglement hazards were found on 40% of the playgrounds surveyed in 1998 (down from 47% in 1996). Until such hazards are eliminated, deaths caused by strangulation will continue to occur.

The CFA/PIRG surveys highlight the great need to improve playground safety across the country. Moreover, there is a clear need for public policy measures on the federal, state, and local levels to ensure that the widespread, potentially life-threatening hazards are eliminated. We have an obligation to provide children with safe outdoor play areas in which they can play, learn, and grow.

In addition to hazard elimination, efforts should be directed at improving adult supervision of children on playgrounds. Children are children and can be expected to play in unintended, sometimes dangerous ways. Adult guidance, steering children away from potential hazards and redirecting their energies toward safe play, prevents injuries. Of course, attentive supervision cannot replace safe design, high quality construction, and good maintenance, nor can safe design, high quality construction, and good maintenance replace attentive supervision. Even the best equipment and playgrounds can be hazardous places for children if adults are not present and involved in children's play. Children need safe play areas and good adult supervision.

Overview of Report Contents

CFA's primary goal is to help educate those who are responsible for and care about playgrounds -- including parents, school administrators, child care providers, park personnel, and designers -- so that they can advocate for safe playgrounds and make informed decisions when purchasing play equipment and designing the layout of play areas. This document is, therefore, a blueprint for designing, building, and maintaining public playgrounds. CFA presents its safety and design criteria in the form of model law provisions that can be adopted by states, cities, counties, recreation and parks departments, child care licensing agencies, or other entities responsible for public outdoor play spaces. The contents of the report are reviewed briefly below.

Section 2 of the report discusses injury data which establish common injury scenarios for both younger and older children . Recognizing the causes of injury provides a basis for design requirements that eliminate hazards whenever possible. Careful design from a human factors and developmental perspective can also help minimize the potential for injury.

Section 3 discusses other critical developmental issues that affect playground safety, including how children's capabilities and limitations at different ages relate to their play and injury patterns. The information on developmental issues has been expanded significantly since the first edition. CFA has added detailed recommendations on selecting and designing safe, developmentally appropriate play equipment and areas for preschool-age and school-age children. This section also addresses the need for attentive adult supervision on all playgrounds to help ensure children's safety.

The model law provisions are specific safety and design criteria, presented in three sections of requirements.

- **Section 4** -- requirements applicable to **all** play areas and equipment.
- **Section 5** -- requirements applicable to **preschool-age** play areas and equipment, intended for children 2 through 5 years old.
- **Section 6** -- requirements applicable to **school-age** play areas and equipment, intended for children 5 through 12 years old.

The requirements that apply to an individual play area will depend on the age of children for whom it is designed. A child care center for children five and under, for example, should meet the requirements of Section 4 as well as Section 5. An elementary school, on the other hand, should meet the requirements of Sections 4 and 6. Play areas intended for use by children as young as two and as old as twelve should meet the requirements of Section 4 and include equipment, grouped by age, that meets the requirements of Section 5 or 6 as applicable.

A crucial difference between the CPSC and CFA documents is the level of attention given to developmental issues. This document includes two separate sections of requirements for preschool-age and school-age playgrounds because CFA provides so many safety and design criteria for which the requirement is different for the two age groups. Although the CPSC handbook does include some recommendations for preschool-age versus school-age playgrounds, this developmental distinction is not made consistently or often enough. CFA believes that this distinction is extremely important since children are frequently injured while playing on equipment designed for a different age group. Younger

children, in particular, are at an increased risk of injury when they play on equipment that is not appropriately sized.

Another crucial difference between the CPSC and CFA documents is the inclusion of rationale for the requirements. The CPSC handbook provides detailed rationale in only a few cases. CFA believes that including explanations of why requirements are necessary (e.g., a documented pattern of injury) and what the background is for requirements (e.g., anthropometric data corresponding to equipment dimensions) will enhance understanding of and compliance with the safety criteria. Therefore, CFA provides rationale for the requirements wherever possible throughout its report.

Following the three sections of requirements for public play equipment and areas, Section 7 presents a discussion of playgrounds and compliance with the Americans with Disabilities Act. However, this report does not include specific design recommendations for how to comply with the law. Like the CPSC handbook, equipment components designed or modified solely for use by disabled children are not addressed by these guidelines. The federal government is now developing detailed access requirements for outdoor play spaces.

Section 8 lists references for this report. Section 9 lists major sources of playground safety information and available resources. Appendix A includes CPSC Safety Alerts and CPSC Notices of Recalls. Appendix B is a revised CFA Parent Checklist, which itemizes twelve common hazards that parents and others can use to check the safety of their local playgrounds.

The information included in this report addresses play areas and equipment associated with schools, child care centers, parks, residential developments, institutions, and other public recreation places. Further, it addresses equipment which is fixed (i.e., anchored to the ground), not portable. The requirements do not apply to play equipment designed for home, backyard use, amusement park equipment, soft contained play equipment, water park facilities including swimming pools, or sports equipment. These requirements also do not apply to fitness trail exercise equipment intended for adult use, provided that it is not located on or adjacent to a children's playground.

How to use the Model Law Provisions

This document contains numbered items which are **requirements** that could be adopted as law. In some cases, CFA provides **rationale** for the requirement, shown in italicized text immediately the requirement. Where appropriate, CFA also give introductory comments and explanations at the beginning of major sections. In some general content areas, CFA offers additional information, intended as guidance only not as requirements.

Each requirement has its own identification number and is labeled with an **A**, **B**, or **C**. The labeling codes are as follows.

- Requirements labeled with an **A** are specifications of **CFA only**.
- Requirements labeled with a **B** are specifications of both **CFA and CPSC**.
- Requirements labeled with a **C** are specifications of **CPSC only**.

In order to follow the similarities and differences between the CFA and CPSC requirements, pay close attention to the numbers assigned to each requirement For every CFA model law provision, we have noted whether CPSC has the same requirement, a different requirement, or no requirement. This CFA report addresses every issue addressed by the 1997 CPSC handbook; the majority of these provisions are the same. However, CFA also addresses a substantial number of issues not addressed by CPSC. So for each requirement, there are three possibilities with respect to CFA and CPSC versions, as follows.

- In many cases, CFA and CPSC recommend the same specification. A requirement included by both CFA and CPSC will appear only once and its identification number will be labeled with a **B**.
- Where CFA and CPSC both address the same issue but the CFA specification is more stringent, the CFA and CPSC requirements are each given the same identification number but the CFA version is labeled with an **A** while the CPSC version is labeled with a **C**.
- Where CFA addresses an issue that is not addressed by CPSC, again there are **A** and **C** versions for the same identification number. The **A** specification provides CFA's requirement while the **C** specification indicates "No specific requirement by CPSC."

There are no cases in which a CFA and CPSC requirement conflict. If a piece of play equipment or play area complies with all CFA specifications, it also complies with all CPSC specifications. However, a piece of play equipment or play area could comply with all CPSC specifications without complying with all CFA specifications because CFA addresses additional issues or is more stringent in some cases.

To adopt all CFA specifications, adopt requirements labeled with either an A or B. This approach would include a complete representation of the 1997 CPSC guidelines while also going beyond the scope of CPSC to address additional content areas and to provide more stringent specifications in some areas. It is important to recognize that CFA makes many more developmental distinctions than CPSC, providing different requirements for preschool-age and school-age children.

To adopt all CPSC specifications but not additional or more stringent CFA specifications, adopt requirements labeled with either a B or C. Because all CPSC specifications are included in this document, this approach would include a complete representation of the 1997 CPSC guidelines.

In order to obtain the greatest level of safety, it is recommended that all CFA provisions in the model law be adopted. However, it is possible to adopt a section or subsection depending upon need. A child care licensing entity, for example, might adopt only Sections 4 and 5 (general and preschool-age requirements), if they only regulate centers serving children five and under. The protective surfacing provisions in Section 4.1 may be enough in some circumstances.

CFA believes that, at a minimum, provisions addressing life-threatening hazards should be mandated, including requirements regarding:

- protective surfacing,
- maximum height limitations,
- guardrails and protective barriers,
- clothing entanglement,
- head entrapment, and
- hard-hitting swings.

Compliance with these provisions will dramatically reduce the risks of severe fall injuries, strangulation, and moving impact incidents, thus making our nation's playgrounds significantly safer for our children.

It should be noted that the model law provisions contained herein are substantive in nature but do not include any administrative requirements or provisions. For example, there are no enforcement provisions, such as penalties for non-compliance. Additionally, the administering agency is not delineated, allowing legislative or regulatory bodies to specify the appropriate agency.

This report and the CFA model law provisions represent what we believe is state of the art at the time of printing. If any or all of these provisions are adopted, a system of review should also incorporated to assure that the provisions are updated as necessary.

Section 2

PLAYGROUND INJURIES

Injury data clearly show that public playground equipment continues to be a major cause of injury and death for children in this country[1]. The CPSC now estimates that nearly 150,000 children under the age of 15 are treated in hospital emergency rooms annually for injuries related to public playground equipment (see Table 2-1). Further, the CPSC estimates that at least 15 deaths related to playground equipment occur each year.

Table 2-1[2]

Adjusted Public Playground Injury Estimates by Age 1990-1994[a]

	Year				
Age[b]	1990	1991	1992	1993	1994
<2 Years	3,600	4,600	5,020	4,220	4,370
2-4 Years	27,830	31,860	31,900	29,690	31,140
5-9 Years	80,450	81,640	91,250	83,860	83,810
10-14 Years	28,570	28,670	30,030	27,880	27,350
Total	140,440	146,760	158,200	145,640	146,670

[a]Out-of-scope injuries and homemade playground equipment-related injuries were removed from the total. Detail may not add to total due to independent rounding.
[b]Based on the age distribution found in the known public location for individual years.
Source: NEISS

The cost of playground equipment-related injuries in 1992 was estimated to be $1 billion, according to the National Program for Playground Safety.

---

[1] The injury data and analysis presented here are based on current CPSC estimates of playground equipment-related injuries, an earlier detailed CPSC report on playground equipment-related injuries (Tinsworth and Kramer, 1990) as well as a comprehensive review of data from both national and international sources (Ratté et al., 1990).
[2] Table 2-1 was provided by the CPSC.

Causes of Playground Injuries and Deaths

Falls -- usually to the ground surface below equipment -- account for approximately 75 percent of all injuries related to public playground equipment. Not only are falls the most common mode of injury for children of all ages, they are also related to the most severe injuries. Nine out of ten serious injuries (mainly head injuries and fractures) are caused by falls to the surface. Further, the CPSC estimates that at least one-third of fatalities associated with playground equipment involve falls. Of all fatalities caused by falls, 75 percent involve head injuries.

Other causes of injury involve impact with moving equipment, running into stationary equipment, sharp edges, protrusions, pinch points, hot surfaces, and debris in the play area.

Other causes of death involve strangulation, impact with moving equipment, and equipment failures or tip-overs. Strangulation accounts for almost half of all fatalities related to playground equipment. Most strangulation incidents involve entanglement. The typical entanglement scenario occurs because something a child is wearing gets caught on equipment -- very often on slides or swings. Clothing, scarves, mittens, jacket strings, and jacket hoods have become entangled in narrow gaps between equipment components, openings or holes at the top of slides, on vertical posts, and on open connecting links such as "S" hooks, causing death by strangulation. Ropes, jump ropes, and leashes, either attached to equipment or being worn around a child's neck, have also been implicated in strangulation deaths. Similarly, free hanging ropes are also a cause of playground fatalities. The other major cause of strangulation is head entrapment. The fatalities resulting from impact with moving equipment generally involve head injuries resulting from swing impact; children under the age of six are almost always the victims in these cases.

While there are no significant gender differences in the injury data, different patterns of injury emerge for children of different ages (see Figure 2-1 and Figure 2-2). Children under the age of six suffer approximately 37 percent of all public playground equipment-related injuries, children between the ages of six and eight are involved in another 40 percent, and children over the age of eight are involved in another 23 percent. Children between the ages of 6 and 8 years thus have the highest rate of injury on public playground equipment. However, the frequency of injury to children under the age of six has doubled since 1980.

Slides are the most frequent cause of injury for *children under the age of six*. Superficial facial injuries (i.e., lacerations and contusions) and serious head injuries (i.e., skull fractures, concussions, and internal head injuries) are the two predominant patterns of injury for young children on slides, swings, and climbers.

Although falls are the most common mode of injury for both younger and older children, younger children are more likely to sustain injuries to the head and face. When young children fall to the surface from play equipment, they are more susceptible to head injuries since they often do not have the motor coordination or cognitive skills necessary to protect their heads by breaking a fall with their arms. In addition, young children are at greater risk for head and facial injuries caused by impact with moving equipment such as swings.

Climbers are the most frequent cause of injury for *children six and older*. Upper limb fracture is the predominant pattern of injury for older children on climbers, swings, and slides.

Because older children's cognitive and perceptual skills are more refined, they better anticipate and avoid moving swings. They are also better able to react to a fall, typically using their arms to break their landing. Consequently, older children reduce the risk of head injury, but they simultaneously increase the risk of upper limb fracture.

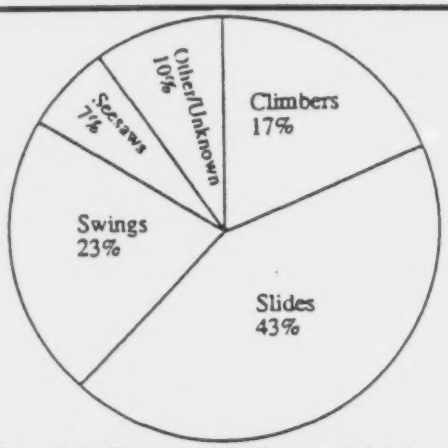


Figure 2-1: Playground Equipment-Related Injuries Sustained by Children Under 6

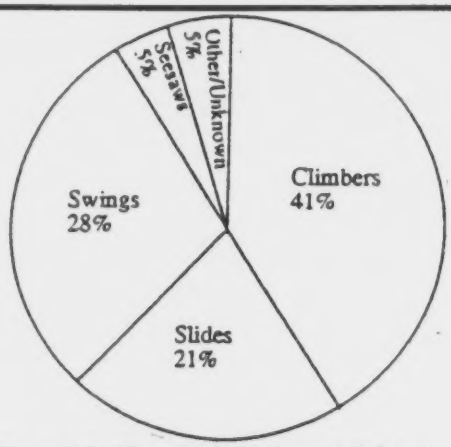


Figure 2-2: Playground Equipment-Related Injuries Sustained by Children 6 and Over

Climber Injuries

Approximately 32 percent of all injuries associated with public playground equipment involve climbers. Almost all climber-related injuries are due to falls; 75 percent are attributed to falls to the surface. Falls often occur as children are making transitions between access/egress components and platforms or other play events.

Of all injuries on climbers, 80 percent are sustained by children over the age of six. In fact, climbers are the type of equipment most frequently implicated in playground injuries for children six and older -- which may be explained in part by older children's boldness to experiment with creative climbing techniques. Within this age group, climbers account for 41 percent of all equipment-related injuries.

Slide Injuries

Slides account for almost 30 percent of all public playground equipment-related injuries. Of all injuries sustained on slides, one-half are associated with falls to the surface below the equipment, and another one-fourth involve falls onto other parts of the equipment. Falls from the platform, from the top of the slide, and from the top portion of the slide chute are most common. Falls also often occur as children climb ladders that access slide structures. When compared to other types of equipment, slides tend to have higher rates of serious head injuries.

Children under the age of six incur over half of the slide-related injuries. Moreover, slides are the type of equipment most frequently implicated in playground injuries for children under the age of six. Within this age group, slides are involved in 43 percent of all equipment-related injuries. This high rate

of slide injuries among young children may be due to their heavy use of this type of equipment in combination with their less developed balance and coordination skills. Maintaining an upright seated position while sliding down the chute may be rather difficult for many young children. Younger children also tend to slide down the chute face first. Because older children are not as likely to have trouble balancing on slides and because they are not as likely to play on slides as younger children, they tend not to suffer as many injuries.

Swing Injuries

Swings are involved in about 26 percent of all injuries related to public playground equipment. Falls account for approximately two-thirds of swing injuries, most being falls to the surface. Impact with moving swings, however, causes one-fourth of all swing injuries. Children under the age of six are those most often injured during moving impact incidents. The typical scenario involves a young child walking in front of or behind a moving swing and getting hit, either by the seat itself or by a child in the seat. Injuries to the head and face are, therefore, common. Overall, the younger age group sustains two-thirds of swing-related injuries. When older children suffer injuries on swings, it is usually because they fell while standing on or jumping from the seats.

Seesaw Injuries

Seesaws account for about 6 percent of all injuries related to public playground equipment. Impact with moving equipment (typically wooden seats) is the most common mode of seesaw injuries, accounting for about two-thirds of these injuries. Falls to the surface are involved in most other seesaw injuries, but splinters on worn or damaged wooden seesaw seats have caused puncture wounds. More than two-thirds of seesaw injuries are lacerations to the head and face. When compared to other types of equipment, however, seesaws are involved in trunk fractures and spinal injuries more frequently. Children six and older sustain 54 percent of seesaw-related injuries.

Merry-Go-Round Injuries

Injuries related to merry-go-rounds occur when children fall while getting off or while pushing the equipment and when children are hit by the moving undercarriage. Serious injuries (i.e., fractures) as well as superficial injuries (i.e., lacerations and contusions) to the arm, leg, and head have been reported for merry-go-round incidents. Both younger and older children suffer injuries while playing on merry-go-rounds.

Spring Rocking Equipment Injuries

Spring rocking equipment has been implicated in fall injuries as well as injuries caused by impact with the equipment. The most common scenario involves a child getting hit in the face while pushing a spring rocker up and down.

Section 3

DEVELOPMENTAL ISSUES FOR PLAYGROUND DESIGNERS

Children's primary task is to make sense of the world around them -- to learn. Children's primary concern is to have fun. Through play and exploration of the physical and social environments, children have fun learning. Given a stimulating environment, children will keep themselves happy by exploring and making up games since they are naturally inquisitive and creative. Adults must ensure that the environments in which children play and learn are safe.

The most basic safety consideration for designers of play equipment and areas is to eliminate hazards. Challenge is desirable because children learn and increase their skills through challenge. But the challenges presented must be ones that children can perceive and choose to undertake. When taking a risk involves a dangerous outcome that the child cannot foresee, a challenge becomes a hazard. Such hazards are what cause playground-related injuries and sometimes even death.

A carefully designed playground provides a setting where safe learning -- not just physical development -- can take place. Cognitive, social, and emotional growth can all be supported by outdoor play. This section presents strategies to increase the safety as well as the play value of outdoor areas by providing a wide range of play equipment and other stimulating activities. Information addressing developmental issues in playground design is drawn from the design work and writing of Morrison (1993); Moore, Goltsman, and Iacofano (1992); Dodge and Colker (1992); as well as the research base developed by Comsis Corporation for the CPSC (Ratté et al., 1990).

The Value of Play

The power of play in the developmental process cannot be overemphasized. Play is a fundamental part of each child's world. Because play is the way children explore and manipulate their environments and also the way they interact with each other, it is perhaps the most influential catalyst for growth and learning during childhood.

The outdoor play environment is unique. Children feel a special freedom and have a natural curiosity to explore outside. It is, therefore, an especially wonderful place for children to learn through play. Playing outdoors is much more than running around, making noise, and blowing off steam. Playing outdoors is also much more than physical play and development. If the outdoor environment stimulates exploration, children's natural curiosity will bring developmental achievement well beyond the realm of physical skills.

While playing outside, young children work on a variety of cognitive, social, and emotional tasks such as: building self-esteem; exhibiting independence; developing positive styles of social interaction like sharing, cooperating, and helping; taking other points of view; expressing creativity; improving decision-making and problem-solving skills; identifying cause and effect relationships; and, using basic symbols and representational abilities. Older children continue to work on these same tasks at higher

levels while also integrating new ones, such as: reasoning logically; operating according to complex rules; and, manipulating symbols in their heads without corresponding physical action.

In order for children to experience this type of learning outdoors, however, careful attention must be given to children's developmental needs during the design process.

The Human Factors Approach

The Human Factors approach to design applies ergonomic principles together with child development knowledge. Ergonomics tells us that what must be considered above all else during the design process is the user. Whether you are designing a tool, product, task, or environment, ergonomics dictates that the user's needs, interests, skills, and comfort come first. In this case, the users are children. Playground designers must, therefore, put children first and address age-related factors. Child development knowledge highlights the great importance of play for learning and what forms of play are most influential at different stages. In addition, the acquisition of certain skills relates to both play and injury patterns.

To present safe challenges that are appealing to children, equipment and materials must be developmentally appropriate, which requires attention to the age of the intended players as well as to individual differences (Bredekamp, 1987). Children's individual rates of physical development differ substantially. Moreover, physical growth for a single child is not necessarily uniform; different physical attributes and skills develop at different times. Consideration of cognitive, social, and emotional development further expands the range of individual differences which relate to safe outdoor play.

Play areas should, therefore, include a variety of equipment and materials suited to the range of skills expected within a given age group. Ideally, the play activities available will present a series of graduated challenges, allowing individual children to practice and test the limits of their skills at their own pace. The challenges should span the range from easy to difficult. Thus, children can move through the series of challenges progressively as their skills bring mastery.

Children's Sizes and Skills

Children of different ages are obviously different sizes: younger children are smaller than older children. But the issue of matching play equipment dimensions to children's sizes is not quite that simple. Anthropometric data provide details on children's physical sizes which can be related to the safe use of play equipment. For example, the vertical rise of a step ladder should not exceed the step height of the smallest intended user. The step height of a 5th percentile 2-year-old is 8.7 inches; a step ladder designed for preschool-age children should, therefore, not have a vertical rise greater than 9 inches. The height of protective barriers should be higher than the center of gravity of the largest intended user. The standing center of gravity of a 95th percentile 12-year-old is 35.8 inches; protective barriers on play equipment designed for school-age children must, therefore, be at least 38 inches high. Openings created by play equipment components should be small enough to prevent entry of a child's torso or large enough to allow free passage of a child's head, to protect against strangulation by head entrapment. Openings must, therefore, be either smaller than 3.5 inches (the torso depth of the smallest child at risk) or greater than 9 inches (the largest head dimension of the largest child at risk, which is the distance from

the chin to the back of the head). These are just a few examples, but any dimension critical to children's safe use of play equipment should have an anthropometric basis. Throughout the remaining sections of this publication, anthropometric data are given as the rationale for design requirements.

Both preschool-age and school-age children are working to develop small and large muscles, to increase endurance, to gain strength and flexibility, to improve balance, and to coordinate eye-hand movements. They also face the tasks of increasing spatial awareness and refining perceptual skills. Playgrounds typically support physical development quite well. But that is not enough. Playgrounds must also build cognitive, social, and emotional skills -- the skills children need to become functional adults in our society. If appropriately set up, the outdoor play area is an effective environment for growth and learning in all domains of development.

Children's Play Interests and Developmental Goals

Like children's sizes and skills, their play interests change over time with increasing age. Younger children, for example, spend more time engaging in constructive and pretend play than older children. In contrast, older children spend more time engaging in active play than younger children. Children of all ages enjoy social and sensory play, but younger and older children have different environmental needs to support these forms of play. The playground should mirror these age-related play patterns.

For preschool-age children, the ideal playground will offer several activity areas supporting different types of play. Active play equipment -- appropriately scaled for young children -- should be installed with resilient surfacing in a separate area and should not be the focus of the playground. There should also be a constructive play area, opportunities for pretend play, a grass play area, and a paved play area for riding toys such as a path around the play area.

Young children first play in parallel with others. Only after individual skills are mastered do they begin to play interactively. In addition, preschoolers most often play in pairs rather than groups. Play equipment for this age group should reflect these patterns. For example, two play counters or two steering wheels could be located in close proximity. The scale of play equipment -- active and otherwise -- should be smaller so that dyads feel secure playing together in a defined space.

Constructive play requires manipulative materials. Sand is traditional, but children also enjoy digging, pouring, and shaping other fluid materials such as snow, mud, gravel. Adding water to sand play opens up a whole new world of textures and building potential. A variety of props should also be available to enhance constructive play. The list of appropriate loose materials is virtually endless: buckets, bowls, shovels, scoops, funnels, blocks, plastic people, animal figures, cars, and trucks. All should be of a size that are hard to lose and do not pose a choking hazard to very young children who still mouth small objects. Outdoor storage will facilitate the use of such materials. Sand and water play is critical not only for its cognitive, social, and emotional benefits but also because it improves small muscle control and eye-hand coordination.

To promote pretend play and the development of creative thinking, the playground should offer semi-enclosed spaces. Small play houses are best, and props that support children's dramatic adventures should be available. Semi-enclosed spaces are also gathering places for social interaction. Because young children typically interact in pairs, as mentioned above, these spaces should be relatively small. Play

houses are well-suited to sand play areas and will increase the complexity of both constructive and pretend play. Decks, roofs, and spaces under decks all encourage pretend and social play on active play structures -- but should not be the only opportunities for these important forms of play.

Grass areas allow for small group games (e.g., duck duck goose) or quiet individual play. Young children sometimes need a retreat from the hustle-bustle of activity. Play houses, grass areas, and seating areas (e.g., benches, tree stumps, or large rocks) overlooking the playground all serve this purpose well. Tables make picnics easy and also transform indoor activities -- such as art projects, puzzles, or board games -- to the outside environment.

Play with wheeled toys requires a paved area. For preschool-age children, a riding path is ideal. Along with the physical skills fostered by riding tricycles and pulling wagons, cognitive development can be promoted by offering decision points along the path. Slight undulations and textured portions provide additional sensory stimulation.

As children grow older, their interest in constructive and pretend play declines and they become more focused on active play. Developing physical skills and fitness is a primary goal. Active play equipment should, therefore, take a more dominating role for school-age children. The equipment's scale and challenge level should be greater. However, excessive height is never prudent -- increase challenge horizontally instead of vertically. Linked play structures -- also referred to a composite play structures -- are optimal because they effectively offer a range of easy to very challenging climbing activities while also offering many decision points. Consequently, school-age children will continually change their play patterns, creating different starting points and paths through the structure. Larger decks are also recommended to accommodate the small group nature of older children's play patterns.

While this older age group does have more physical energy, they still expend it in a short time. So providing supplementary outdoor activity areas remains important. Open grass fields provide a place for older children to play and organize complex games with rules and other large group activities, challenging their higher cognitive functioning. Paved play areas for this age group should also be larger (in contrast to riding paths) to facilitate hopscotch, basketball, roller skating, and street hockey. To promote social interaction, older children simply need a place to "hang out" in groups; group size increases with age as the peer group takes on an increasingly influential role in development. Partially sheltered seating areas adjacent to the play area are perfect for socializing among children 10 and older. Tables and shade trees similarly support social interaction.

Regardless of age, children need a sense of security before they will play freely. Careful attention to natural features will create an aesthetically pleasing environment while also providing learning opportunities for children of all ages. Children will test physical skills climbing up hills and on rocks. They will make collections of leaves, sticks, and pine cones to use as props for pretend play or as materials for art projects. They will build self-esteem nurturing plants and vegetables in their own garden. They will increase their awareness of natural living things and processes as they observe animal life and changes in weather. They will experience varied sensory stimulation through the many different colors, shapes, textures, smells, and sounds of the natural environment. The play area should offer a wide range of plantings, within reach as well as sight. Exploring nature can be an endless science experiment if the setting and program allow for hands-on discovery learning.

The developmental goals that children can work on during outdoor play are the same as those that indoor activities are designed to nurture. Just as the indoor environment addresses a wide range of

skills, so too must the outdoor environment. Designing playgrounds from a developmental perspective will broaden the present focus on active play to better match children's play interests. Moreover, the safety of playgrounds is increased dramatically when the scope of outdoor play is expanded to include developmentally appropriate activity areas. Not only does active play equipment hold the greatest potential for injury, but without other interesting possibilities to explore children get bored and use the equipment in unintended -- often dangerous -- ways. Developmentally appropriate play is not only fun for children, it is also safe and will promote learning.

Other Factors that Influence the Safe Design of Active Play Equipment

Certain other developmental factors also directly influence the design of safer equipment. Given certain cognitive and perceptual limitations, young children may unknowingly put themselves in a dangerous position. Young children often do not attend to peripheral stimuli. A moving swing, for example, outside direct sight lines may go unnoticed. Further, young children commonly center on a single idea or event. As a result, injuries often occur because young children inadvertently walk into the path of a moving swing while concentrating on other activities. Locating swings away from other equipment reduces the risk of moving impact incidents.

Another information processing skill many preschoolers have not yet fully developed is the evaluation of spatial relations. Children may climb higher than they intend to -- exposing themselves to greater fall hazards -- since they often estimate height incorrectly. One way to address unrecognized fall heights is to provide protective barriers on all platforms above 30 inches. Design techniques such as stepped or layered platforms also improve safety by limiting fall heights.

Because young children focus on the "here and now," they can think critically only about their current actions; they cannot reverse their thinking or think ahead. Consequently, children may find themselves in a frightening situation without a manageable way to get down from equipment. In addition, the ability to descend typically lags behind the ability to ascend the same or similar structures, so even when children can climb up a particular component they may not be able to climb down safely. Designers of play equipment can help reduce this problem by providing at least one easy means of access to and egress from each piece of equipment. Larger platforms also help because a child is less likely to feel rushed to complete a play event if there is enough space to stand and watch others.

Safety is increased when children have options and, consequently, are not forced to complete an activity which is beyond their capabilities. Play structures should have multiple means of access/egress, allowing children to choose among play components of varying degrees of difficulty. Children should also be able to choose from different types of equipment offering different levels of challenge for similar skills. Balance beams, suspension bridges, and swings challenge various balance skills, for example. A key point to remember is that while increasing height does not necessarily increase challenge, it always increases hazard. Both challenge and complexity can be added to play equipment horizontally and within a limited height. Providing a range of diverse challenges on play equipment is an important factor in addressing individual developmental differences and, therefore, in reducing injuries caused by children playing on equipment beyond their size and skill levels.

Supervision

Because children are children, good adult supervision is a critical safety factor from a developmental perspective. Adult guidance, steering children away from potential hazards and redirecting their energies toward safe play, is an effective and essential means of preventing injuries. Of course, attentive supervision cannot replace safe design, high quality construction, and good maintenance, nor can safe design, high quality construction, and good maintenance replace attentive supervision. Even the best equipment and playgrounds can be dangerous places for children if adults are not present and involved in children's play.

To provide good supervision, it is important that all adults serving as supervisors on playgrounds be knowledgeable about children's play and injury patterns as well as safe playground design and maintenance. The detailed information in this report can help prepare adults to supervise children on playgrounds. The *Parent Checklist* in Appendix B is a useful summary document that alerts parents and others to key safety criteria.

It is especially important for playground supervisors to be aware of what types of play equipment are appropriate for children of different ages so they can guide children toward safe play. An understanding of children's developmental skills is critical. The summary below, in addition to more specific requirements throughout this report, provides some of the necessary background information. Of course, younger children require more attentive adult supervision on playgrounds than do older children, given the differences in skill levels.

Recommendations for Playground Design

To safely provide a range of developmentally appropriate equipment and to promote various types of play, playgrounds should be designed with activity areas presenting different play opportunities as discussed above. Defining different play spaces helps children recognize what activities are appropriate where and is likely to promote better circulation and wider use of the available equipment. This type of playground organization puts into practice the human factors design approach. Activity areas expand the program of outdoor play to include constructive, pretend, social, and sensory forms of play along with active play. The result is playgrounds that are safer, better suited to children's developmental needs, and more accessible.

Preschool-age playgrounds should provide concretely defined activity areas, without a major emphasis on any one area. Preferably, the different activity areas will be defined by surface types (i.e., grass, wood chips, sand) and/or pathways. Pathways directing children along easy paths of travel among the activity areas help control traffic and reduce interference, which may help reduce injuries. Pathways also have play value for preschoolers who love to play with wheeled toys. Alternatively, a low hedge or other visual or tactile edges can be an effective means of separating activity areas intended for different skill levels or activities. Short walls, for example, provide a good boundary while also serving as a sitting and gathering place (supporting social play) and offering balancing and climbing opportunities.

School-age playgrounds can also be organized loosely into activity areas. The definition of the areas, however, need not be as distinct. Older children's more refined skills -- cognitive as well as physical -- help them better control and direct their play appropriately. The key for this age group is to

ensure that although active play equipment may take a dominating role, other essential play opportunities, such as social gathering places, are also provided.

The overall playground design will depend on the age group for whom the playground is intended. While recognizing that every playground may not be able to provide each recommended activity area and type of equipment, every effort should be made to provide as diverse a range of play opportunities as possible -- this does impact safety! Public playgrounds can effectively supply the setting and major fixtures for play and learning; the supply of additional props (e.g., sand toys, tricycles, etc.) is the responsibility of those using the facility. In child care and school settings these additional play props should be part of the curriculum; outdoor storage is recommended to facilitate their use.

The next four pages present in list form a summary of recommendations regarding the selection of appropriate equipment and the design of appropriate play areas for the developmental needs and abilities of preschool-age and school-age children. This information repeats the key points of the discussion above and also includes certain key design requirements from the sections which follow.

SUMMARY -- Preschool-Age Children

Appropriate Play Equipment and Activity Areas for Preschool-Age Children

P1. Constructive Play Area -- Constructive play is a favorite of preschoolers and should be included wherever feasible.

- Manipulative material to dig in and build with, such as sand (at a depth of at least 12 inches but preferably 15 to 18 inches).
- Water nearby to increase the complexity of play, where possible.
- Low work surfaces for construction projects, such as tree trunk slices or other small tables. A short wall (timbers or otherwise) defining the sand play area is also a good place to build. Many play houses provide tables or shelves that facilitate integration of constructive, social, and pretend forms of play, if located in a sand area.
- Manipulative toys and props (e.g., shovels, blocks, trucks) enhance constructive play. For public playgrounds (as compared to child care or school settings), these are expected to be supplied by playground users.

P2. Opportunities for Social and Pretend Play -- Small to medium sized, semi-enclosed spaces are best since preschoolers interact in pairs. More generic or undefined structures and spaces allow children to imagine and create a wider spectrum of events and dramas. Possibilities include:

- Play house (optimally located in or near a constructive play area).
- Play spaces underneath decks of active play structures with play counters and/or other panels such as mirrors, windows, and interactive components. Roofs above decks encourage social and pretend play. Talk tubes associated with active play structures are also an interesting feature.
- Play spaces created by natural features such as berms, large rocks, large trees, retaining or border walls.
- Grassy areas up on low hills slightly above and away from other areas encourage social and pretend play while also providing a place for quiet play.
- Small deck or stage at ground level.
- Props to enhance pretend play. For public playgrounds (as compared to child care or school settings), these are expected to be supplied by playground users.

P3. Active Play Area -- Provide as much variety as possible and a range of challenge, from easy to moderately difficult.

- Protective surfacing is required under and around all active play equipment (see Section 4.1).
- The scale of active play equipment must be suitable for this age group's sizes and skills.
- Linked play structures are best because children have options and can choose events and a path of travel that matches their skill levels. On free-standing equipment, such as independent slides, young children often get stuck at the top on a very small platform, scared to slide down but also unable to descend the ladder safely. Free-standing arch climbers and free-standing flexible climbers such as cargo nets should also be avoided for this age group. Linked play structures eliminate this "no way out" problem.
- Provide at least one easy way up to and down from each structure: options include stairways and stepped decks with a vertical rise of no more than 12 inches. If stepped decks have increments of 8 inches or less, they are accessible to a wider range of ages and skills levels.

- Provide a range of climbing events to decks of different heights. The more challenging events should access lower decks. The maximum recommended deck height is four feet for preschool-age children.
- Provide a range of slides from decks of different heights. Wide slides and tandem slides are especially good for this age group.
- Upper body events must be at lower heights and challenge levels than those for older children. Only the upper end of this age range will have the skills and coordination necessary to master these events. Overhead horizontal ladders, for example, should be shorter in length (i.e., less rungs across) and the handhold height should not exceed 60 inches. In addition, rungs should be parallel and evenly spaced given preschoolers' less refined physical and perceptual capabilities. Overhead rings and vertical sliding poles should be avoided for this age group. Turning or chinning bars, 36 to 48 inches high, however, are a good upper body event for preschool-age children.
- Suspension or clatter bridges are an excellent play event for all ages. For preschool-age children, they should be limited to 30 inches or less above the protective surface.
- Short tunnels are fun for toddlers and preschoolers and provide a good social play space on active play structures.
- Select a variety of protective barrier walls, including some that have play interest such as bubble windows or panels with steering wheels.
- Create play spaces under the high decks by including play counters or other interactive panels. Mirror panels and window panels are especially good under decks.
- Consider roofs to provide shade and a sense of enclosure to stimulate social and pretend play.
- When space permits, swings are an excellent source of physical and sensory stimulation. Both infant seats (preferably the fully-enclosed bucket style made of rubber) and belt seats are appropriate. In addition, tire swings are good for the older children of this group, especially since three children can swing on the tire together which promotes social interaction.
- Preschool-age children do not typically have the requisite physical skills to safely negotiate rotating equipment without adult assistance. If a merry-go-round is included, it must be a very small one with limited speed. Small concave dish-like merry-go-rounds in which children sit are more suitable than the flat platform design for preschoolers.
- Spring rockers will be enjoyed by the younger children of this group; this equipment tests balance and coordination skills while also providing sensory stimulation. Locating spring rockers in pairs stimulates parallel play. Selecting those with two or more seats allows for both parallel and interactive play.
- Balance beams (limited to 12 inches high) also challenge balance and coordination skills.

P4. Opportunities for Play with Wheeled Toys -- A paved riding path (concrete or asphalt) is best and can also help define different play areas. Play with wheeled toys is very important for toddlers and preschoolers. Pushing wheeled toys is a great way for toddlers to practice walking on their own.

- Riding paths must be wide enough so that two tricycles or wagons can pass: 48 inches minimum.
- If the riding path offers turns and decision points, it provides better cognitive stimulation.
- If the riding path offers textured sections or undulations, it provides better sensory stimulation.

P5. Quiet Play Area -- Children of all ages need a place to retreat or to play quietly.

- Grass area, preferably shaded. This is especially important for infants and toddlers since grass provides a much better surface for crawling and learning to walk than wood chips.
- Incorporating a gentle berm provides important sensory stimulation when children run up and roll down it. Additionally, it is a good first climbing activity for infants and toddlers.
- Include at least one bench and also a picnic table when possible. Picnic tables facilitate the transfer of indoor activities, such as eating and art projects, to the outdoor environment.

P6. Natural Features -- Play in the outdoor environment should include opportunities to explore nature. Attention to the landscaping of playgrounds increases aesthetic and as well as play value. Playgrounds should include as much variety in the selection of plantings and trees as possible (but avoid all potentially harmful species). Sensory stimulation is enhanced with each different color, shape, texture, and smell. Shade is critical for all playgrounds.

SUMMARY -- School-Age Children

Appropriate Play Equipment and Activity Areas for School-Age Children

S1. Active Play Area -- Provide as much variety as possible and a range of challenge, from easy to difficult.

- Protective surfacing is required under and around all active play equipment (see Section 4.1).
- The scale of active play equipment must be suitable for this age group's sizes and skills.
- Linked play structures are best because children have options and can choose events and a path of travel that matches their skill levels. Older children will also increase the complexity of their play by choosing different paths among the components of a linked play structure.
- Provide at least one easy way up to and down from each structure: options include stairways and stepped decks with a vertical rise of no more than 18 inches. If stepped decks are restricted to increments of 8 inches or less, they are accessible to a wider range of ages and skills levels.
- Provide a range of climbing events to decks of different heights. The maximum recommended deck height is six feet for school-age children.
- Provide a range of slides from decks of different heights. Older children love wave and spiral slides. Banister slides are also good for school-age children.
- Upper body events are particularly important for older children. Overhead horizontal ladders (including those with staggered rungs or changes in direction), overhead rings, sliding poles, parallel bars, and chinning bars are all good choices for this age group.
- Suspension or clatter bridges are an excellent play event for all ages. For school-age children they should be limited to 48 inches or less above the protective surface.
- Select a variety of protective barrier walls, including some that have play interest such as bubble windows or tic tac toe panels. Steering wheels will not be used as frequently by this age group.
- Create play spaces under the high decks by including play counters or other interactive panels. Mirror panels and window panels are especially good under decks. These spaces will be used primarily by the younger children of this age group for social and pretend play.
- Consider roofs to provide shade and a sense of enclosure to stimulate social and pretend play.
- When space permits, swings are an excellent source of physical and sensory stimulation. The 5- to 9-year-olds will still enjoy lots of swinging, on both traditional swings and tire swings. The pre-teens will use swings as a social gathering place.
- Rotating equipment is much more appropriate for school-age children than preschoolers, although it is not considered a necessity for every school-age playground. Its primary benefits is sensory stimulation. Select the smaller diameter merry-go-rounds or the log rolls, all of which should be low to the ground.
- Spring rockers are not very interesting for school-age children, perhaps with the exception of spring platforms.
- Balance beams (limited to 12 inches high) challenge balance and coordination skills.

S2. Social Play Area -- Because older children interact in small groups, social play spaces should accommodate at least three children. Providing social play areas is critical, because building positive social skills is a key developmental milestone for this age group. Possibilities include:

- Cluster of benches and/or picnic tables. At the upper end of this school-age group, children need places to just "hang out" with small groups of friends.

- Play spaces created by natural features such as berms, large rocks, large trees, retaining or border walls.
- Grassy areas up on low hills slightly above and away from other areas encourage social and pretend play while also providing a place for quiet play.
- Play spaces underneath decks of active play structures with play counters and/or other panels such as mirrors, windows, and interactive components. Roofs above decks encourage social and pretend play. Talk tubes associated with active play structures are also an interesting feature for the younger children of this age range.
- Large play houses are good for the 5- to 9-year-old age range and also promote pretend play (optimally located in or near a constructive play area).
- Deck or stage at ground level.

S3. **Constructive and Pretend Play Opportunities** -- Constructive and pretend play remain important during the early elementary school years. Wherever feasible, include the necessary materials and equipment.

- Manipulative materials to dig in and build with, such as sand (at a depth of at least 12 inches but preferably 15 to 18 inches).
- Water nearby to increase the complexity of play, where possible.
- Play house or stage setting for pretend dramas.
- Low work surfaces for construction projects, such as tree trunk slices or other small tables. A short wall (timbers or otherwise) defining the sand play area is also a good place to build. Many play houses provide tables or shelves that facilitate integration of constructive, social, and pretend forms of play, if located in a sand area.
- Manipulative toys and props (e.g., shovels, blocks, trucks) enhance constructive and pretend play. For public playgrounds (as compared to child care or school settings), these are expected to be supplied by playground users.

S4. **Area for Organized Games** -- Older children, particularly at the upper end of this age range, engage in organized games with rules that challenge physical, cognitive, and social skills. Paved areas and/or open grass fields are appropriate. These play surfaces and spaces can be provided in an adjacent or nearby area.

S5. **Quiet Play Area** -- Children of all ages need a place to retreat or to play quietly.

- Grass area, preferably shaded. For this age group, a larger space is better. When space allows, children will use this grass area for games in pairs or small groups, such as catch, Frisbee, etc. as well as for more passive play and socializing.
- Incorporating a gentle berm gives older children a nice place to "hang out" away from the primary activity areas. Berms provide a setting for socialization and peer group interaction, which is especially important for the ten plus age range.
- Seating for this age group should accommodate clusters of children. Locating two or more benches together is optimal. Picnic tables likewise allow small groups to congregate.

S6. **Natural Features** -- Play in the outdoor environment should include opportunities to explore nature. Attention to the landscaping of playgrounds increases aesthetic and as well as play value. Playgrounds should include as much variety in the selection of plantings and trees as possible (but avoid all potentially harmful species). Sensory stimulation is enhanced with each different color, shape, texture, and smell. Shade is critical for all playgrounds.

Section 4

SAFETY AND DESIGN REQUIREMENTS FOR ALL PLAY AREAS

4.1 Protective Surfacing
4.1.1 General Requirements
4.1.2 Paved Surfaces
4.1.3 Loose-fill Surfacing Materials
4.1.4 Unitary Synthetic Surfacing Materials
4.1.5 Maximum Height of Equipment
4.1.6 Fall (Use) Zones
4.1.7 Buffer Zones

4.2 Layout of the Play Area

4.3 Site and Equipment Selection

4.4 Materials

4.5 Assembly and Installation

4.6 Maintenance

4.7 General Hazards
4.7.1 Sharp Points, Corners, and Edges
4.7.2 Protrusions and Projections; Connecting Hardware; Entanglement Hazards
4.7.3 Pinch, Crush, and Shearing Points; Moving Parts
4.7.4 Head and Neck Entrapment
4.7.5 Trip Hazards
4.7.6 Suspended Hazards
4.7.7 Electrical Hazards

Important Note:

This document contains numbered items which are **requirements** that could be adopted as law. In some cases, CFA provides **rationale** for the requirement, shown in italicized text immediately the requirement. Where appropriate, CFA also give introductory comments and explanations at the beginning of major sections. In some general content areas, CFA offers additional information, intended as guidance only not as requirements.

Each requirement has its own identification number and is labeled with an **A**, **B**, or **C**. The labeling codes are as follows.

- Requirements labeled with an **A** are specifications of **CFA only**.
- Requirements labeled with a **B** are specifications of both **CFA and CPSC**.
- Requirements labeled with a **C** are specifications of **CPSC only**.

In order to follow the similarities and differences between the CFA and CPSC requirements, pay close attention to the numbers assigned to each requirement For every CFA model law provision, we have noted whether CPSC has the same requirement, a different requirement, or no requirement. This CFA report addresses every issue addressed by the 1997 CPSC handbook; the majority of these provisions are the same. However, CFA also addresses a substantial number of issues not addressed by CPSC. So for each requirement, there are three possibilities with respect to CFA and CPSC versions, as follows.

- In many cases, CFA and CPSC recommend the same specification. A requirement included by both CFA and CPSC will appear only once and its identification number will be labeled with a **B**.
- Where CFA and CPSC both address the same issue but the CFA specification is more stringent, the CFA and CPSC requirements are each given the same identification number but the CFA version is labeled with an **A** while the CPSC version is labeled with a **C**.
- Where CFA addresses an issue that is not addressed by CPSC, again there are **A** and **C** versions for the same identification number. The **A** specification provides CFA's requirement while the **C** specification indicates "No specific requirement by CPSC."

There are no cases in which a CFA and CPSC requirement conflict. If a piece of play equipment or play area complies with all CFA specifications, it also complies with all CPSC specifications. However, a piece of play equipment or play area could comply with all CPSC specifications without complying with all CFA specifications because CFA addresses additional issues or is more stringent in some cases.

To adopt all CFA specifications, adopt requirements labeled with either an A or B. This approach would include a complete representation of the 1997 CPSC guidelines while also going beyond the scope of CPSC to address additional content areas and to provide more stringent specifications in some areas. It is important to recognize that CFA makes many more developmental distinctions than CPSC, providing different requirements for preschool-age and school-age children.

To adopt all CPSC specifications but not additional or more stringent CFA specifications, adopt requirements labeled with either a B or C. Because all CPSC specifications are included in this document, this approach would include a complete representation of the 1997 CPSC guidelines.

4.1 Protective Surfacing

Falls from play equipment have the potential to cause life-threatening head impact injuries. The surfacing on which a falling child lands is a major determinant of the injury-causing potential of the fall. Protective surfacing cannot prevent all injuries due to falls, but it can help reduce both the frequency and severity of injuries. Falls onto a resilient surface are less likely to result in a life-threatening injury. The greater the resiliency of the surface, the greater the safety (Collantes, 1990; CPSC, 1990).

The goal of installing protective surfacing is to prevent serious head injuries. Although there are no data available which can exactly predict the human head's tolerance for impact, biomedical researchers have described two methods to determine when impact is likely to cause a life-threatening head injury (Collantes, 1990; CPSC, 1990).

One method suggests that the threshold for a life-threatening head injury is achieved when the peak deceleration of the head during impact exceeds 200 times the force of gravity (i.e., 200 G's). The second method suggests that the threshold for a life-threatening head injury is achieved when the value of the Head Injury Criterion (HIC) exceeds 1,000. HIC is a mathematical formula which assesses the deceleration of the head during impact together with the time duration over which the head decelerates to a halt (Collantes, 1990; CPSC, 1990).

The Peak G method measures the impact attenuation qualities of the surfacing material, but the HIC method provides a better estimate of the severity of injury. Safety and protection from serious head injuries can be maximized by considering both the Peak G and HIC measures when evaluating playground surfacing materials (Collantes, 1990; CPSC, 1990).

4.1.1 GENERAL REQUIREMENTS

CFA/CPSC **4.1.1.1-B** Protective surfacing which has a Critical Height value of at least the height of the highest designated play surface (i.e., Fall Height, see Section 4.1.5.1) of the play event shall be provided under and around all play equipment.

Rationale: Surfacing materials, even though they may be resilient, will not provide adequate protection unless their impact-absorbing qualities are sufficient for the highest accessible part of the play event.

Special Note: The Critical Height tests for surfaces are based on protection against life-threatening head impact injuries. CFA believes it is also important to provide protection against other serious injuries, such as concussion or limb fracture, which may occur with less impact. CFA, therefore, recommends that the Critical Height of a surfacing material exceed the fall height of the equipment under which it is being installed by at least 2 feet as an added safety precaution.

SAFETY ALERT: Falls account for approximately 75% of all injuries related to public playground equipment. In addition, at least one-third of fatalities associated with playground equipment involve falls. ***Protective surfacing under and around all play equipment is, therefore, the most critical safety measure on any playground.*** *Installation and maintenance of protective surfacing to meet the criteria for resiliency is essential.*

CFA/CPSC **4.1.1.2-B** The Critical Height value of a playground surfacing material is defined as the maximum height from which an instrumented metal headform, upon impact, yields both a peak deceleration of no more than 200 G's and an HIC value of no more than 1,000 when tested in accordance with the procedure described in ASTM F1292.

Rationale: Given limited empirical data, Critical Height is the best estimate of the maximum height at which a playground surface is not likely to impart a life-threatening head impact injury.

CFA/CPSC **4.1.1.3-B** Equipment that requires a child to be standing or sitting at ground level during play does not need to follow the specifications for resilient surfacing described in Sections 4.1.1.1 and 4.1.1.2. Examples of such equipment are sand boxes, activity walls, play house, or other equipment that has no elevated designated play surface.

4.1.2 PAVED AND EARTH SURFACE MATERIALS

CFA/CPSC **4.1.2.1-B** Hard surfaces including asphalt and concrete are not acceptable under and around play equipment of any height. [The only exception to this requirement is when a paved surface is installed as a base, beneath a shock absorbing unitary material such as a rubber mat.]

Rationale: None of these materials provides adequate protection against head injuries. Paved surfaces can impart peak decelerations exceeding 200 G's from heights as low as 2 inches.

CFA/CPSC **4.1.2.2-B** Earth surfaces including soils, hard packed dirt, grass, and turf are not acceptable under and around play equipment.

Rationale: None of these materials provides adequate protection against head injuries. The shock-absorbing qualities of earth surfaces can vary widely with changes in environmental conditions as well as with wear.

4.1.3 LOOSE-FILL SURFACING MATERIALS

CFA/CPSC **4.1.3.1-B** Loose-fill organic and inorganic materials shall be acceptable for use under and around play equipment provided that they meet the requirements for Critical Height (see Section 4.1.1). Table 4-1 reports data collected by the CPSC on the Critical Heights of various organic and inorganic loose materials at different depths.

Many loose-fill surfacing materials are both available and acceptable for use as playground surfaces when installed at sufficient depths; acceptable surfacing materials include but are not necessarily limited to wood chips, bark mulch, engineered wood fibers, sand, pea gravel, and shredded tires. Various climatic and environmental conditions are related to the impact-absorbing qualities of both organic and inorganic loose-fill surfacing materials. The advantages and disadvantages described in Table 4-2 should be carefully evaluated before selecting protective surfacing.

CFA/CPSC **4.1.3.2-B** Loose-fill surfacing materials shall not be installed over hard surfaces such as asphalt or concrete.

Rationale: installation of acceptable loose-fill materials over hard surfaces may reduce or eliminate their impact-absorbing qualities.

CFA **4.1.3.3-A** Loose-fill surfacing materials, such as wood chips or sand, shall be installed at depths of at least 9 but preferably 12 inches. However, for shredded tires, a depth of at least 6 inches is sufficient.

Rationale: Although certain loose-fill surfacing materials may be able to meet Critical Height requirements at lesser depths in controlled laboratory settings, actual outdoor use by large numbers of children typically results in compaction and displacement of the surfacing. Organic loose-fill surfacing materials, such as wood materials, are also subject to decomposition caused by exposure to the elements as well as by children's play. Compaction, displacement, and decomposition all reduce depth and, consequently, resiliency. Installing loose-fill surfacing materials at generous depths will help minimize these problems.

CPSC **4.1.3.3-C** No specific requirement by CPSC.

CFA/CPSC **4.1.3.4-B** When loose-fill surfacing materials are used, a method of containment shall be provided around the perimeter of the use zone.

Rationale: Providing a method of containment, such as building a retaining wall or excavating a pit, helps prevent excessive displacement of loose-fill surfacing materials.

CFA **4.1.3.5-A** To maximize drainage for loose-fill surfacing materials, especially wood products and sand, it is recommended that a drainage system consisting of at least gravel and filter cloth be installed below the loose-fill surfacing materials.

Rationale: Inadequate drainage causes rapid decomposition of wood products and compaction of sand, both of which can reduce resiliency and consequently also reduce protection against injuries.

CPSC **4.1.3.5-C** No specific requirement by CPSC.

CFA/CPSC **4.1.3.6-B** Loose-fill surfacing materials shall be inspected frequently and maintained at the depth required to achieve the necessary Critical Height.

Installers of playground equipment and protective surfacing are encouraged to attach markers to the equipment support posts that indicate the correct level of loose-fill materials under and around the equipment. Such markers will assist maintenance workers in determining when replenishment of the surfacing is necessary.

Rationale: Depending on playground location, weather conditions, and frequency of use, frequent maintenance may be required to ensure that loose-fill surfacing materials are not compacted and displaced. If the depth of loose-fill surfacing materials is reduced, their resiliency may be reduced.

Table 4-1[3]

Critical Heights of Loose-Fill Surfacing Materials Tested by CPSC

The following table indicates the Critical Height (as defined in Section 4.1.1.2) of various loose-fill surfacing materials that were tested by the CPSC.[4] These values are approximate and relative, rather than absolute. This table is intended to serve only as a guide in evaluating different surfacing materials. There may be other loose-fill surfacing materials such as bark nuggets that have shock absorbing properties equivalent to those shown in this table.

To use this table, select a surfacing material and read the data across the table; the data indicate the approximate maximum fall height for which the surfacing material meets the criteria for adequate impact absorption at three uncompressed depths and one compressed depth. For example, engineered wood fibers, when they are installed at a depth of 9 inches and when they are not compressed, provide adequate protection for equipment with a fall height of up to 7 feet. However, when a 9-inch depth of , engineered wood fibers has become compressed, the Critical Height is reduced to 6 feet.

Regular use of the playground can cause displacement and compaction of loose-fill surfacing materials, reducing their depth and resulting in different shock absorbing properties. As shown above, the Critical Height of each of these materials is reduced when compressed. It is, therefore, important to allow an extra margin of safety when determining the depth at which the materials should be installed. To ensure that the required level of protection against head impact injuries is not compromised, frequent maintenance is necessary to retain adequate depth of loose-fill surfacing materials under and around all play equipment.

more...

[3] Table 4-1 is an adaptation of a table in the CPSC *Handbook for Public Playground Safety*.

[4] Detailed descriptions of the materials tested and procedures used are available in the CPSC test reports (Collantes, 1990; CPSC, 1990; Ramsey and Preston, 1990).

Table 4-1 (continued)

Critical Heights (in feet) of Loose-Fill Surfacing Materials Tested by CPSC

MATERIAL	UNCOMPRESSED DEPTH			COMPRESSED DEPTH
	6 inch	9 inch	12 inch	9 inch
Wood Chips*	7	10	11	10
Double Shredded Bark Mulch	6	10	11	7
Engineered Wood Fibers**	6	7	>12	6
Fine Sand	5	5	9	5
Coarse Sand	5	5	6	4
Fine Gravel	6	7	10	6
Medium Gravel	5	5	6	5
Shredded Tires***	10-12	N/A	N/A	N/A

* This product was referred to as Wood Mulch in previous versions of this handbook. The term Wood Chips more accurately describes the product.

** This product was referred to as Uniform Wood Chips in previous versions of this handbook. In the playground industry, the product is more commonly known as Engineered Wood Fibers.

*** This data is from tests conducted by independent testing laboratories on a 6 inch depth of uncompressed shredded tire samples produced by four manufacturers. The tests reported critical heights which varied from 10 feet to greater than 12 feet. It is recommended that persons seeking to install shredded tires as a protective surface request test data from the supplier showing the critical height of the material when it was tested in accordance with ASTM F1292.

BEST COPY AVAILABLE

Table 4-2[5]

Issues to Consider for Loose-Fill Surfacing Materials

Advantages

- Various loose-fill surfacing materials are available which can satisfy impact attenuation requirements and provide protection against serious head impact injuries when installed at sufficient depth.
- Because loose materials will spread to conform to the shape of a falling body, these surfacing materials may further reduce the potential for injury, particularly to the arms and legs.
- Loose-fill materials are readily available and, when compared to unitary synthetic surfacing materials, the cost of loose-fill materials is usually substantially lower.
- Installation of loose-fill materials is relatively easy.
- Sand and gravel are nonflammable.
- Organic loose-fill materials drain well.
- Inorganic loose-fill materials do not pulverize over time.
- Organic loose-fill materials tend to be less abrasive .

Disadvantages

- The impact attenuation characteristics of loose-fill materials may vary with changes in environmental conditions. The Critical Height values can be significantly reduced when these materials get wet and/or freeze. Sand, for example, acts as a hard, rigid surface when wet. Bark mulch retains water and, therefore, decomposes more quickly and can be reduced to a soil-like compost that does not provide adequate protection against fall injuries.
- Organic loose-fill materials naturally decompose and pulverize with use and then compact, reducing depth and resiliency.
- With normal use, loose-fill materials combine with dirt and are easily displaced out of the containment area, reducing depth and resiliency.
- Loose-fill materials can conceal trash and other debris (e.g., broken glass, nails, pencils, and other sharp objects that can cause cut and puncture injuries) as well as animal excrement.
- Sand is easily tracked out of the play area on children's clothing and shoes; sand is abrasive to indoor floors as well as plastics materials.
- Organic loose-fill materials are subject to microbial growth when wet.
- Shredded tires may be flammable, may soil children's clothing unless treated, and may contain steel wires from steel belted tires (note: some manufacturers provide a wire-free guarantee).
- All loose-fill materials can get thrown around by children. Wood chips and engineered wood fibers are preferable from this standpoint, however. Bark mulch and gravel can create a lot of dust, which may irritate some children. Sand and gravel can both cause eye injuries. In addition, children tend to put gravel in their noses, ears, and mouths.
- Loose-fill materials, particularly gravel, are more difficult to walk on, and are not accessible to children with disabilities.
- Although sand can meet Critical Height requirements and it also has play value, separate areas should be provided for sand play. Children, especially younger ones, are at increased risk of injury if they are focused on sand play and, consequently, inattentive to surrounding play patterns.

more...

[5]Table 4-2 is an adaptation of an appendix in the CPSC *Handbook for Public Playground Safety*.

Table 4-2 (continued)

Issues to Consider for Loose-Fill Surfacing Materials

Installation and Maintenance

- Loose-fill materials cannot be installed over paved surfaces.
- Loose-fill materials require a method of containment.
- Loose-fill materials need good drainage underneath the surfacing.
- Loose-fill materials require frequent maintenance to ensure that an adequate depth is retained. Maintenance should include raking, sifting, grading, and leveling to minimize compaction of materials, and to remove debris. Periodic renewal or replacement of materials will also be necessary to maintain adequate depth.
- Gravel materials may develop a hard pan surface under heavy-use areas over time. Periodic break-up and removal of this hard pan is important to maintain impact attenuation properties.
- Sand is susceptible to fouling by animals and may require cleaning and turning over periodically in addition to raking, sifting, grading, and leveling.

4.1.4 UNITARY SYNTHETIC SURFACING MATERIALS

Unitary synthetic surfacing materials are generally rubber mats or tiles or a combination of rubber-like materials held in place by a binder that may be poured in place at the playground site and then cured to form a unitary shock absorbing surface. Unitary materials are available from many different manufacturers and with many different shock absorbing qualities.

CFA/CPSC **4.1.4.1-B** Unitary synthetic surfaces shall be acceptable for use under and around play equipment provided that they meet the requirements for Critical Height (see Section 4.1.1).

The advantages and disadvantages of unitary synthetic surfaces described in Table 4-3 should be carefully evaluated before selecting protective surfacing.

CFA/CPSC **4.1.4.2-B** All unitary synthetic surfaces shall be tested for their impact attenuation performance in accordance with ASTM F1292. Test data documenting the Critical Height of all unitary synthetic surfaces shall be made available to purchasers by the manufacturer.

CFA/CPSC **4.1.4.3-B** Manufacturers of unitary synthetic surfaces shall provide any site requirements for proper installation and maintenance to purchasers.

Table 4-3[6]

Issues to Consider for Unitary Synthetic Surfacing Materials

Advantages

- Various unitary synthetic surfacing materials -- both in the form of pre-molded tiles and pour-in-place systems -- are available that can satisfy requirements regarding impact attenuation and provide protection against serious head impact injuries when an adequate thickness is selected. These surfaces provide consistent resiliency.
- Unitary synthetic materials are not subject to decomposition and displacement.
- Unitary synthetic materials generally provide better footing than loose-fill materials. This type of surface is easily accessible to children with disabilities.
- Many unitary synthetic materials come with warranties. Check with the manufacturer.
- Unitary synthetic materials often come in a variety of colors. Check with the manufacturer.

Disadvantages

- The impact attenuation performance of unitary synthetic surfacing materials varies widely. Purchasers must obtain test data regarding the Critical Height of each surface from its manufacturer. Be sure to ask about the surface's HIC values for different drop heights, because some unitary synthetic materials do not perform as well as when both the Peak G and HIC measures are used (as compared to Peak G alone).
- Some unitary synthetic materials are subject to extreme temperature. Check with the manufacturer regarding any possible reductions in resiliency and or other damage caused by different environmental conditions.
- The initial cost of unitary synthetic materials is usually high, as compared to loose-fill materials.
- Some unitary synthetic materials do not allow good water drainage. Check with the manufacturer.
- Some unitary synthetic materials may not be slip-resistant. Check with the manufacturer.
- Some unitary synthetic materials may be flammable. Check with the manufacturer.
- Edges of rubber tiles may curl up and cause trip hazards.
- Unitary synthetic materials may be subject to vandalism (e.g., the surface may be ignited, defaced, cut).

Installation and Maintenance

- Some unitary synthetic materials require special conditions (e.g., a paved and/or level base) and procedures (e.g., expert under-surface preparation) for proper installation. Check with the manufacturer.
- Following initial installation, very little maintenance is required for most unitary synthetic surfaces. This type of protective surfacing is quite easy to keep clean and free of debris and does not require any raking or replacement.

[6]Table 4-3 is an adaptation of an appendix in the CPSC *Handbook for Public Playground Safety*.

4.1.5 MAXIMUM HEIGHT OF EQUIPMENT

4.1.5.1 Fall Height Definitions for Different Types of Equipment

CFA/CPSC **4.1.5.1.1-B** The fall height of each play event shall not be higher than the Critical Height of the protective surfacing installed under and around the equipment (see Section 4.1.1.1).

The fall heights of various types of equipment, which is the highest designated play surface of the play event, are defined below.

CFA/CPSC **4.1.5.1.2-B** **For climbing equipment**, the fall height is defined as the height of the highest climbing member, such as a rung or platform, above the protective surfacing.

CFA/CPSC **4.1.5.1.3-B** **For slides**, the fall height is defined as the height of the platform or slide chute entrance above the protective surfacing.

CFA/CPSC **4.1.5.1.4-B** **For swings**, the fall height is defined as the height of the swing's pivot point above the protective surfacing; the pivot point is where the swing's suspending members connect to the support structure.

CFA/CPSC **4.1.5.1.5-B** **For rotating equipment**, the fall height is defined as the highest part at the perimeter of the rotating component on which a child may sit or stand.

CFA/CPSC **4.1.5.1.6-B** **For seesaws**, the fall height is defined as the highest attainable position of any part of the seesaw.

CFA/CPSC **4.1.5.1.7-B** **For spring rocking equipment**, the fall height is defined as the at rest, unoccupied height of the seat assembly or designated play surface.

4.1.5.2 Maximum Fall Height Requirements for Different Types of Equipment

SAFETY ALERT: Limiting the height of play equipment is an essential means of preventing severe fall-related injuries. Heights greater than the maximum fall heights specified below are not necessary for play value and serve only to increase the risk of injury.

CFA	**4.1.5.2.1-A**	**For climbing equipment**, the maximum fall height shall not exceed: • 4 feet above the protective surfacing when designed for preschool-age children. • 6 feet above the protective surfacing when designed for school-age children. Special Note: In Sections 5.1 and 6.1, there are several exceptions to these maximum requirements for certain types of climbing equipment -- such as arch ladders, climbers with flexible components, turning bars, parallel bars, and balance beams -- for which lower maximum heights are specified. In addition, there is one type of climbing equipment-- overhead horizontal ladders -- for which a higher maximum height is allowed.
CPSC	**4.1.5.2.1-C**	No specific requirement by CPSC.
CFA	**4.1.5.2.2-A**	**For slides**, the maximum fall height shall not exceed: • 4 feet above the protective surfacing when designed for preschool-age children. • 6 feet above the protective surfacing when designed for school-age children.
CPSC	**4.1.5.2.2-C**	No specific requirement by CPSC.
CFA	**4.1.5.2.3-A**	**For swings,** the fall height shall not exceed 8 feet above the protective surfacing, regardless of whether the structure is for conventional to-fro seats, infant/tot seats, or tire swings and regardless of whether the playground is designed for preschool-age or school-age children.
CPSC	**4.1.5.2.3-C**	**For swings,** the fall height shall not exceed 8 feet above the protective surfacing when intended for preschool-age children. No maximum is specified for school-age children.
CFA	**4.1.5.2.4-A**	**For rotating equipment other than merry-go-rounds**, the fall height shall not exceed 2 feet above the protective surfacing.
CPSC	**4.1.5.2.4-C**	No specific requirement by CPSC.
CFA	**4.1.5.2.5-A**	**For merry-go-rounds**, the standing surface of merry-go-rounds shall not exceed 1 foot above the protective surfacing. When seats are provided on merry-go-rounds, the height of the seats shall not exceed 2 feet above the protective surfacing.
CPSC	**4.1.5.2.5-C**	No specific requirement by CPSC.

CFA	**4.1.5.2.6-A**	**For seesaws**, the fall height of shall not exceed 4 feet above the protective surfacing.
CPSC	**4.1.5.2.6-C**	No specific requirement by CPSC.
CFA	**4.1.5.2.7-A**	**For spring rocking equipment with seats**, the fall height shall not exceed 2 feet above the protective surfacing.
CPSC	**4.1.5.2.7-C**	No specific requirement by CPSC.
CFA	**4.1.5.2.8-A**	**For spring platforms**, the fall height shall not exceed 18 inches above the protective surfacing.
CPSC	**4.1.5.2.8-C**	No specific requirement by CPSC.

4.1.6 FALL (USE) ZONES

Special Note: In the 1997 CPSC Handbook for Public Playground Safety, the terminology for "use zones" and "fall zones" was changed. Earlier editions of the CPSC document, as well as this CFA report, referred to the area under and around play equipment that requires protective surfacing as the fall zone. Now CPSC refers to this area as the "use zone." CFA believes that fall zone remains a more appropriate description and, therefore, continues to define the protective surfacing area as the "fall zone." Consequently, the terms "fall zone" and "use zone" in the current CFA and CPSC documents can be interchanged.

CFA/CPSC	**4.1.6.1-B**	The fall zone is a clear area under and around each piece of play equipment where protective surfacing is required. Specifications for fall zones for different types of equipment are provided below. *Rationale: Fall zone requirements are intended to ensure that children will land on protective surfacing if they fall to the ground below while playing on equipment. In addition, the fall zones provide adequate space for children to use various play events without interfering with the play of other children on different events.*
CFA/CPSC	**4.1.6.2-B**	Other than the play equipment itself, the fall zone shall be free of other separate equipment or activities. The fall zone shall also be free of structural and environmental obstacles which children could run into or fall on. For example, there shall not be any vertical posts or other objects

protruding from the ground within the fall zone surrounding a piece of equipment.

CFA/CPSC **4.1.6.3-B** The fall zones of two stationary pieces of playground equipment that are positioned adjacent to one another may overlap if the adjacent designated play surfaces are no more than 30 inches above the protective surfacing (i.e., they may be located a minimum distance of 6 feet apart). If adjacent play surfaces on either structure exceed a height of 30 inches, the minimum distance between the structures shall be 9 feet.

CFA/CPSC **4.1.6.4-B** **For stationary climbing equipment**, the fall zone shall extend a minimum of 6 feet in all directions from the perimeter of the equipment.

CFA/CPSC **4.1.6.5-B** **For slides** (see Figure 4-1), the fall zone behind the access and to the sides of a slide shall extend a minimum of 6 feet from the perimeter of the equipment (note: this requirement does not apply to embankment slides).

For all slides, the fall zone in front of the exit end shall extend a minimum distance of H+4 feet where H is the vertical distance from the protective surfacing at the exit to the highest point of the chute. However, no matter what H is, the fall zone shall never be less than 6 feet but does not need to be greater than 14 feet. This fall zone shall be measured from a point on the slide chute where the slope is less than 5 degrees from the horizontal. If it cannot be determined where the slope is less than 5 degrees from the horizontal, the fall zone shall be measured from the end of the chute.

The fall zone in front of the exit of a slide shall never overlap the fall zone of any other equipment.

The fall zone behind the access and to the sides of the slide may overlap the fall zone for an adjacent piece of stationary play equipment in accordance with Section 4.1.6.3.

CFA/CPSC **4.1.6.6-B** **For single-axis swings with conventional seats** (see Figure 4-2), the fall zone shall extend a minimum of 6 feet from the perimeter of the support structure on each side.

For swings with conventional seats, the fall zone shall extend in front of and behind the seats a minimum distance of twice the height of the pivot point above the protective surfacing measured from a point directly beneath the pivot on the supporting structure.

The fall zone in front of and behind swings with conventional seats shall never overlap with the fall zone of any other equipment.

The fall zone on the sides of a swing structure for conventional seats may overlap that of an adjacent swing structure.

CFA/CPSC **4.1.6.7-B** **For single-axis swings with infant/tot seats**, the fall zone shall extend a minimum of 6 feet from the perimeter of the support structure on each side.

For swings with infant/tot seats, the fall zone shall extend in front of and behind the seats a minimum distance of twice the height of the pivot point measured from a point directly beneath the pivot to the lowest point on the occupant seating surface when the swing is occupied.

The fall zone in front of and behind swings with infant/tot seats shall never overlap with the fall zone of any other equipment.

The fall zone on the sides of a swing structure for infant/tot seats may overlap that of an adjacent swing structure.

CFA/CPSC **4.1.6.8-B** **For multi-axis swings** (see Figure 4-3), the fall zone shall extend a minimum of 6 feet from the perimeter of the support structure on each side.

For multi-axis swings, the fall zone shall extend in any direction from a point directly beneath the pivot point for a minimum distance of 6 feet plus the length of the suspending members.

The fall zone extending out from the seat of a multi-axis swing shall never overlap with the fall zone of any other equipment.

The fall zone on the sides of a multi-axis swing structure may overlap with that of an adjacent swing structure.

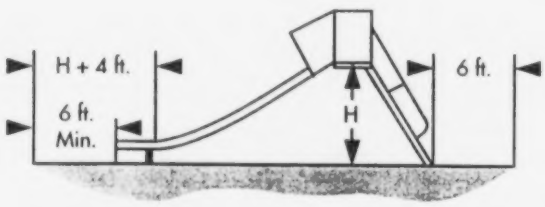
CFA/CPSC **4.1.6.9-B** **For rotating equipment**, the fall zone shall extend a minimum of 6 feet in all directions from the perimeter of the equipment.

The fall zone for rotating equipment shall never overlap with the fall zone of any other equipment.

CFA **4.1.6.10-A** **For seesaws**, the fall zone shall extend a minimum of 6 feet in all directions from the perimeter of the equipment.

The fall zone on either side of a seesaw may overlap with that of an adjacent seesaw.

CPSC	**4.1.6.10-C**	No specific requirement is given by CPSC.
CFA/CPSC	**4.1.6.11-B**	**For spring rocking equipment**, the fall zone shall extend a minimum of 6 feet from the "at rest" perimeter of the equipment.
CFA/CPSC	**4.1.6.12-B**	**For composite play structures**, which consist of modular designs linking various play events, there shall be one total fall zone designed to incorporate a fall zone for each of the attached components using the requirements above as a guide. Note that swings shall not be attached to composite structures (see Sections 5.5.2.3.1, 5.5.3.2.1., 6.5.2.2.1, and 6.5.3.2.1).



Denotes Use Zone with Protective Surfacing

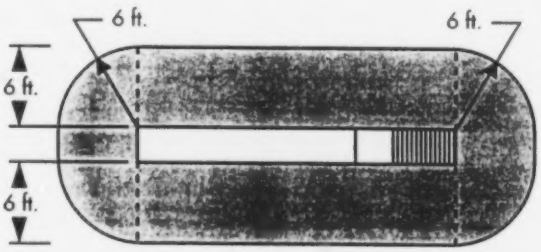
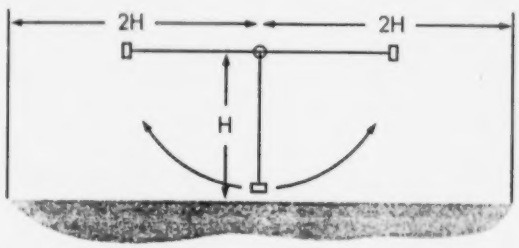


Figure 4-1: Fall Zone for Slides[7]

[7]This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.



Denotes Use Zone with Protective Surfacing

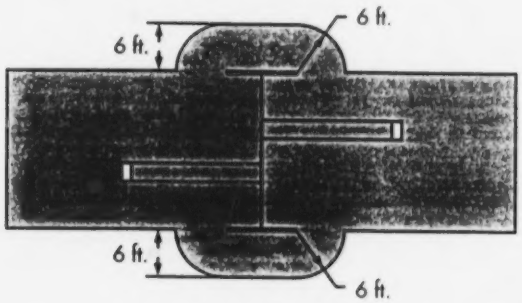
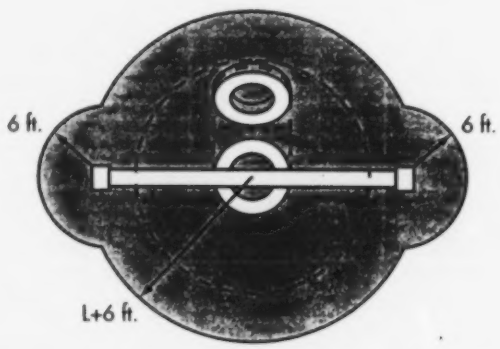


Figure 4-2: Fall Zone for Swings[8]

[8]This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.



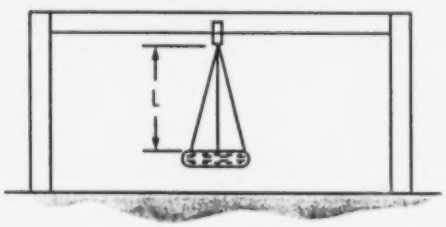


Figure 4-3: Fall Zone for Tire Swings[9]

[9]This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

4.1.7 BUFFER ZONES

CFA **4.1.7.1-A** The no-encroachment or buffer zone, is a clear area beyond the fall zone where children using the equipment can be expected to move about. The buffer zone shall be free of other equipment and activities, but it need not contain protective surfacing (although it may). A buffer zone is required for moving equipment and for equipment or play events from which children exit in motion.

Rationale: Buffer zones are required to ensure that children have extra space to regain their balance and momentum while exiting play equipment in motion without interference from other children. Further, buffer zones provide added protection against injuries caused by impact with moving equipment, which can be life-threatening.

CPSC **4.7.1.1-C** In playgrounds where occasional overcrowding is likely, a supplemental circulation area beyond the use zone is recommended. The decision whether or not to provide such a supplemental circulation area should be based on the professional judgment of the playground designer and/or operator.

CFA **4.1.7.2-A** The buffer zone shall be free of structural and environmental obstacles which children could run into or fall on. For example, there shall not be any vertical posts or other objects protruding from the ground within the fall zone or buffer zone surrounding a piece of equipment.

CPSC **4.1.7.2-C** No specific requirement by CPSC.

CFA **4.1.7.3-A** Where buffer zones are required for adjacent, separate pieces of equipment, they may overlap, meaning that two pieces of equipment may share a single buffer zone. In addition, the buffer zone for one piece of equipment may overlap the fall zone for another.

CPSC **4.1.7.3-C** No specific requirement by CPSC.

CFA **4.1.7.4-A** **For stationary climbing equipment**, a buffer zone of at least 6 feet shall be provided beyond the fall zone for play events where children can exit the equipment in motion, but no buffer zone is required where there is no entrance to or exit from the equipment.

CPSC **4.1.7.4-C** No specific requirement by CPSC.

CFA	**4.1.7.5-A**	**For slides**, a buffer zone of at least 6 feet shall be provided beyond the fall zone in front of the exit of the slide and behind the access to the slide, but no buffer zone is required on the sides of the slide.
CPSC	**4.1.7.5-C**	No specific requirement by CPSC.
CFA	**4.1.7.6-A**	**For single-axis swings**, a buffer zone of at least 6 feet shall be provided beyond the fall zone in front of and behind the swing seats, but no buffer zone is required on the sides of the support structure.
CPSC	**4.1.7.6-C**	No specific requirement by CPSC.
CFA	**4.1.7.7-A**	**For multi-axis swings**, a buffer zone of at least 6 feet shall be provided beyond the fall zone in all directions of motion, but no buffer zone is required on the sides of the support structure.
CPSC	**4.1.7.7-C**	No specific requirement by CPSC.
CFA	**4.1.7.8-A**	**For rotating equipment**, a buffer zone of at least 6 feet shall be provided beyond the fall zone in all directions of motion.
CPSC	**4.1.7.8-C**	No specific requirement by CPSC.
CFA/CPSC	**4.1.7.9-B**	**For seesaws**, no specific requirement is given by either CFA or CPSC.
CFA/CPSC	**4.1.7.10-B**	**For spring rocking equipment**, no specific requirement is given by either CFA or CPSC.
CFA	**4.1.7.11-A**	**For composite play structures**, a buffer zone of at least 6 feet shall be provided beyond the fall zone for play events where children can exit the structure in motion. This includes, for example, the areas at the end of slides or in front of climbing components such as arch ladders, cargo nets, or overhead horizontal ladders. No buffer zone is required where there is no entrance to or exit from the structure.
CPSC	**4.1.7.11-C**	No specific requirement by CPSC.

4.2 Layout of the Play Area

CFA/CPSC **4.2.1-B** Areas for play equipment, open fields, and sand boxes, for example, shall be located in different sections of the overall play area so that more active, physical activities are located away from more passive, quiet activities.

Rationale: Organizing the play area into different areas suited for different levels of activity helps prevent injuries caused by conflicting play patterns.

CFA/CPSC **4.2.2-B** Popular, heavy-use pieces of equipment shall be dispersed to avoid crowding.

CFA/CPSC **4.2.3-B** Swings and rotating equipment shall be located away from other equipment, preferably toward an edge of the play area, always maintaining the required zones (see Section 4.1.6).

CFA/CPSC **4.2.4-B** The exit ends of all slides shall be located in uncongested sections of the play area, always maintaining the required fall zones (see Section 4.1.6).

CFA/CPSC **4.2.5-B** Metal slides shall be located in shaded areas to prevent burns caused by direct sun on the slide chute (see Section 4.4.2.2).

CFA/CPSC **4.2.6-B** When several play events are linked together on a composite structure, designers shall carefully evaluate the relative positions of the different events to ensure that all play patterns are complementary.

CFA/CPSC **4.2.7-B** The overall layout of the play area shall be without visual barriers that may hamper adult supervision of all equipment and of the total play space.

CFA/CPSC **4.2.8-B** Play areas designed to serve children of all ages shall include separate areas with appropriately sized equipment for preschool-age and school-age children. These areas shall be distinct and separated by at least a buffer zone of ample physical space.

CFA/CPSC **4.2.9-B** Signage -- It is strongly recommended that a sign be posted in each play area identifying the age of children for whom the equipment is designed. Where a play area includes equipment for both preschool-age and school-age children in separate sections, the sign should make this distinction.

Other possible information to convey on signs in play areas includes but is not limited to: any restrictions regarding use of the play area, the importance of adult supervision in the prevention of injuries, how and where to get help in case of emergency, and how and where to report hazards detected or injuries incurred.

Rationale: Many injuries are caused by children playing on equipment that is designed for a different age group. Adults who accompany children, especially younger children, to the play area should be informed of the intended user age group so that they can encourage appropriate use of the equipment.

Additional Information:

CFA offers this additional information as design guidance because the issues below impact safety and developmental appropriateness, directly or indirectly.

- The use of a low hedge or shrubs can be an effective means of defining play equipment areas intended for different skill and developmental levels.
- Boundaries for different areas can be defined with visual and tactile edges. Further, short walls and other edge treatments may support social play (i.e., they can be sitting and gathering places) and provide opportunities for balancing and climbing.
- It is recommended that pathways be used to direct children along easy travel routes from one piece of equipment to another and between activity areas, because providing some means to control the play and traffic patterns of playing children helps prevent injuries. Defining different play spaces with pathways helps children recognize what activities are appropriate in different areas and will also reduce interference between play in different areas. Good circulation of children around the play area is likely to promote greater use of a wider range of the equipment available.
- Pathways should allow for multi-directional travel which is unobstructed visually.
- Paved surfaces should be provided to support play with wheeled toys. A large open, paved area allows for riding as well as circle and ball games. A greater variety of riding experiences, however, can be provided on meandering paths which include curves, straight sections, slight undulations, and flat and textured portions.

4.3 Site and Equipment Selection

Selecting a good play area site and appropriate equipment requires careful planning and attention to neighborhood and climatic conditions.

4.3.1 SITE CHARACTERISTICS AND NATURAL FEATURES

CFA/CPSC	**4.3.1.1-B**	The site shall be selected and located such that children can travel to and from the play area site safely, on foot or by bicycle.
CFA/CPSC	**4.3.1.2-B**	The site itself shall not present hazards or obstacles to children, such as nearby vehicular traffic. Where children may inadvertently run into the street, a barrier designed to prevent play from spilling over into dangerous areas shall surround the play area; such barriers shall not preclude or impede supervision. When fences are used as barriers, they shall conform to local building codes.
CFA/CPSC	**4.3.1.3-B**	When selecting a site, consideration shall be given to slope and drainage, especially if loose-fill surfacing materials are going to be installed. While a gentle slope may aid in drainage, steep slopes could result in loose-fill materials becoming washed away during periods of heavy rain. Such sites may require re-grading
CFA	**4.3.1.4-A**	The play area shall not have any steep slopes or sudden drop-offs.
CPSC	**4.3.1.4-C**	No specific requirement by CPSC.
CFA	**4.3.1.5-A**	The site and design of the play area shall provide for drainage as necessary to ensure that standing water does not present hazards to children playing on the playground or reduce the resiliency of protective surfacing.
CPSC	**4.3.1.5-C**	No specific requirement by CPSC.
CFA	**4.3.1.6-A**	Plant materials shall not present any hazards such as thorns and shall not be poisonous or toxic.
CPSC	**4.3.1.6-C**	No specific requirement by CPSC.

Additional Information:

CFA offers this additional information as design guidance because the issues below impact safety and developmental appropriateness, directly or indirectly.

- It is strongly recommended that all outdoor play areas be planned with the advice of a professional designer of play equipment as well as a landscape architect. Further, it is recommended that this planning include a full evaluation of the site by a landscape architect. These designs should then be implemented in coordination with a reputable manufacturer of play equipment (see Section 4.3.2).

- Consider including a wide variety of natural features -- such as changes in topography as well as trees and vegetation -- in all play areas. Natural features can add a wide variety of multi-sensory and spatial stimulation while promoting positive play and development for all ages. Because the selection and location of different types of trees and other vegetation is crucial, it is strongly recommended that a landscape architect be consulted.

- Hills, berms, and stepping logs and stones allow for active play on different levels without exposing children to excessive fall heights. Climbing rocks and trees are also options for play areas with good adult supervision.

- Trees and vegetation provide an excellent source of open-ended, manipulative materials (sticks, leaves, fruits, buds, etc.) which support constructive, dramatic, and creative outdoor play. Further, exploration of nature supports cognitive as well as emotional growth.

- Avoid placing trees where children can climb and jump from trees to play equipment.

- Natural features such as tree stumps, large flat rocks, or flat logs can also be used to provide a table-like space for children's play and art projects.

- The site and design of the play area should provide a mix of sun and shade as well as protection from heavy wind, rain, or snow. Effective wind breaks and screening can be designed using trees and vegetation; and deciduous trees allow for shade in summer and sun in winter.

- Sand play is especially important for young children. It is recommended that only clean washed play sand be used in public play areas. Areas for sand play should be large enough to support parallel play by several children as well as larger construction projects by small groups. Sand boxes or pits should be deep enough to allow for digging. The design of sand boxes or pits should also allow for adequate ventilation and drainage.

- A source of water for play, such as a hose hook-up, to complement other fluid materials (e.g., sand, dirt, or snow), is recommended.

- For play areas where portable, loose materials are available to support play and learning, such as at schools and child care centers, sufficient storage facilities shall be easily accessible.

- The provision of sheltered areas, such as a gazebo or other roofed areas, should be considered.

- Seating, such as benches or picnic tables, should be available to accommodate adults who accompany children to the play area. Seating should be oriented to facilitate supervision.

- Trash receptacles should be easily accessible from the play area but located so as not to interfere with the normal traffic patterns of playing children. Preferably, trash receptacles will be located at the periphery of the play area away from equipment and activities. Trash receptacles should be firmly anchored to the ground.

- A clean source of drinking water should be easily accessible from the play area but located so as not to interfere with the normal traffic patterns of playing children. Water fountains should be provided at heights comfortable for both children and adults as well as persons in wheel chairs.

- Whenever possible, restrooms should be easily accessible from the play area.

- The provision of bike racks should be considered. When provided, bike racks should be firmly anchored to the ground and located near an entrance to the site, in an area that does not interfere with the normal traffic patterns of playing children; further, they shall be visible from the actual play area.

- The provision of telephones that can be reached by children and with permanently affixed emergency numbers should be considered.

- For more urban sites, a greater degree of protection surrounding the playground may be necessary; rather than a low fence or hedge, for example, a higher fence or other barrier that will prevent children from intentionally climbing over or through it may be warranted.

4.3.2 CHOOSING PLAY EQUIPMENT AND INSTALLATION CONTRACTORS

Additional Information:

CFA offers this additional information as design guidance because the issues below impact safety and developmental appropriateness, directly or indirectly.

- Purchasers should carefully evaluate equipment from different manufacturers before making a choice.

- It is strongly recommended that play equipment be purchased from a reputable manufacturer who carries product liability insurance and provides a warranty of at least 10 years on the main structures.

- It is strongly recommended that all assembly and installation be completed by a qualified contractor. When choosing an installer, select one that has experience working with the type of play equipment being installed. If the manufacturer has a program to certify installers or retains its own installers, it is recommended that they install the equipment.

- When evaluating proposals for play equipment, it is strongly recommended that purchasers evaluate bids on the basis of safety and developmental appropriateness rather than price alone.

4.4 Materials

Choosing appropriate materials for the design, manufacture, and construction of play equipment directly impacts children's safety.

4.4.1 GENERAL REQUIREMENTS

CFA/CPSC **4.4.1.1-B** All materials shall have a demonstrated record of durability for use in the playground or similar outdoor setting. Any new materials shall be documented or tested accordingly for durability by the playground equipment manufacturer.

CFA/CPSC **4.4.1.2-B** Manufacturers shall ensure that, as a result of contact with playground equipment, users cannot ingest, inhale, or absorb potentially hazardous amounts of preservative chemicals or other treatments applied to the equipment. Manufacturer's shall make documentation available to consumers specifying that preservatives or other treatments that have been used do not present a health hazard to users.

CFA/CPSC **4.4.1.3-B** All paints and other similar finishes shall meet the current CPSC federal regulation for lead in paint[10] (0.06% [600 ppm] maximum lead by dry weight).

A strategy for identifying and controlling leaded paint on playground equipment is available from CPSC.[11] A case-by-case approach is recommended since there are many factors to consider when developing a hazard assessment and plans for appropriate controls.

SAFETY ALERT: Testing by CPSC and various state and local agencies revealed that some older playground equipment in schools, parks, and communities across the U. S. has leaded paint that over time has deteriorated. When playground equipment paint deteriorates, the resulting chips and dust may be ingested by young children who regularly touch the equipment while playing and then transfer the paint chips or dust from their hands to their mouths. The amount of paint that may be ingested can contribute to a hazardous and unnecessarily high lead exposure.

[10] Title 16, Code of Federal Regulations, Part 1303, *Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint.*

[11] CPSC *Staff Recommendations for Identifying and Controlling Lead Paint on Public Playground Equipment.*

CFA	**4.4.1.4-A**	All materials and hardware shall comply with applicable Federal and ASTM standards.
CPSC	**4.4.1.4-C**	No specific requirement by CPSC.

4.4.2 METAL

CFA/CPSC	**4.4.2.1-B**	Metal components subject to structural degradation shall be painted, galvanized, or otherwise treated to prevent rust or other corrosion.
CFA/CPSC	**4.4.2.2-B**	To minimize the risk of contact burn injuries, bare or painted metal surfaces on platforms and slide beds shall be avoided, unless they can be located out of the direct rays of the sun. As an alternative to bare or painted metal, platforms may be fabricated from wood or vinyl-coated metal and slide beds may be fabricated from plastic.

SAFETY ALERT: CPSC issued a warning (see Appendix A) about metal equipment because of incidents in which children suffered second and third degree burns to their hands, legs, and buttocks when they sat on metal stairs, decks, or slides. Younger children are at most risk because, unlike older children who react quickly by pulling away their hands or getting off a hot surface, very young children may remain in place when they contact a hot surface.

CFA/CPSC	**4.4.2.3-B**	All metal components shall conform to the requirements regarding sharp points, corners, and edges in Section 4.7.1.

4.4.3 WOOD

CFA	**4.4.3.1-A**	Wood used to construct play equipment shall be either naturally rot- and insect-resistant or be pressure-treated or otherwise similarly protected against such deterioration.

Rationale: Pressure-treating of wood provides superior protection against rot because it protects the wood from the inside out rather than just on the exterior, and thus it contributes to better structural integrity in the long term.

CPSC	**4.4.3.1-C**	Wood used to construct play equipment shall be either naturally rot- and insect-resistant or be treated to avoid such deterioration.
CFA/CPSC	**4.4.3.2-B**	All pressure-treating of wood shall comply with the latest recommendations of the American Wood Preservers Association. Pressure-treated timbers shall bear the mark of an approved treating inspection agency.
CFA/CPSC	**4.4.3.3-B**	The level of dislodgeable toxin on all pressure-treated wood shall be minimized.
CFA/CPSC	**4.4.3.4-B**	Installers, builders, and consumers who perform wood-working operations, such as sanding, sawing, sawdust disposal, on pressure treated wood shall read the consumer information sheet available at the point of sale. This sheet contains important health precautions and disposal information.
CFA/CPSC	**4.4.3.5-B**	Chromated copper arsenate (CCA) is acceptable for use as a treatment of playground equipment wood, provided that the dislodgeable arsenic on the surface of the wood is minimized. Other preservatives that have low toxicity and may be suitable for playground equipment wood are copper or zinc naphthenates and borates.
CFA/CPSC	**4.4.3.6-B**	Creosote, pentachlorophenol, tributyl tin oxide, and any finishes which contain pesticides shall not be used as preservatives for play equipment because they are too toxic and irritating.
CFA	**4.4.3.7-A**	It is recommended that all wood members be protected annually with a clear coating or sealant such as Raincoat as a extra precaution against severe checking and other deterioration.
CPSC	**4.4.3.7-C**	No specific requirement by CPSC.
CFA/CPSC	**4.4.3.8-B**	All wood members shall conform to the requirements regarding sharp points, corners, and edges in Section 4.7.1.

4.4.4 PLASTIC

CFA	**4.4.4.1-A**	All plastic components and other materials that experience ultraviolet degradation shall be protected against exposure to ultraviolet light.
CPSC	**4.4.4.1-C**	No specific requirement by CPSC.
CFA	**4.4.4.2-A**	All plastic panels used as guardrails, protective barriers, or play components, including window or bubble panels, shall be shatter resistant.
CPSC	**4.4.4.2-C**	No specific requirement by CPSC.

4.4.5 HARDWARE

CFA/CPSC	**4.4.5.1-B**	When installed and tightened in accordance with the manufacturer's instructions, all fasteners, connecting, and covering devices shall not be removable without the use of tools to protect against unintentional or unauthorized loosening. Hardware in all moving joints shall also be secured from unintentional or unauthorized loosening.
CFA/CPSC	**4.4.5.2-B**	Lock washers, self-locking nuts, or other locking means shall be provided for all nuts and bolts to protect against detachment.
CFA/CPSC	**4.4.5.3-B**	All fasteners shall be corrosion resistant and be selected to minimize the likelihood of corrosion to the materials they connect.
CFA	**4.4.5.4-A**	Chains used to suspend swings or as climbing components shall be at least 4/0 welded link, proof coil steel chain and be hot-dipped galvanized, zinc plated, vinyl-coated, or otherwise protected against corrosion.
CPSC	**4.4.5.4-C**	No specific requirement by CPSC.
CFA	**4.4.5.5-A**	All swing hangers, including tire swivels, and other moving parts shall be commercial grade and designed to reduce wear.
CPSC	**4.4.5.5-C**	No specific requirement by CPSC.

CFA/CPSC **4.4.5.6-B** Bearing used in moving joints shall be easy to lubricate or be self-lubricating.

CFA/CPSC **4.4.5.7-B** All hardware shall comply with the requirements regarding protrusions and projections as well as entanglement hazards in Section 4.7.2.

CFA/CPSC **4.4.5.8-B** All moving parts shall comply with the requirements regarding pinch, crush, and shearing points in Section 4.7.3.

4.5 Assembly and Installation

Proper assembly and installation are crucial to the structural integrity, stability, and overall safety of play equipment. If the assembly and installation procedures specified by the manufacturer are not followed, the safety of play equipment may be jeopardized.

CFA	**4.5.1-A**	Manufacturers of play equipment shall provide a parts list as well as detailed instructions for assembly and installation, including specifications for secure anchoring. These instructions shall include requirements for proper protective surfacing under and around all play equipment. Warnings regarding the risks of deviating from these instructions shall also be included.
CPSC	**4.5.1-C**	No specific requirement by CPSC.
CFA/CPSC	**4.5.2-B**	All play equipment shall be carefully assembled and installed according to the manufacturer's instructions.
CFA/CPSC	**4.5.3-B**	When properly installed as directed by the manufacturer's instructions and specifications, all play equipment shall be able to withstand the maximum anticipated forces generated by active play which might cause it to overturn, tip, slide, or move in any way. Secure anchoring is a key factor to stable installation. The anchoring process shall be completed in strict accordance with the manufacturer's specifications, because the required footing sizes and depths or method of surface anchoring may vary according to the equipment type.
CFA/CPSC	**4.5.4-B**	All play equipment shall be thoroughly inspected prior to its first use.
CFA/CPSC	**4.5.5-B**	The owner/operator of the play area shall retain all documentation relevant to the purchase, design, assembly, and installation of play equipment.
CFA	**4.5.6-A**	All play equipment shall identify its manufacturer and/or custom designer. This identification shall be durable and permanently affixed to each structure.
CPSC	**4.5.6-C**	No specific requirement by CPSC.

4.6 Maintenance

The safety of play equipment and areas depends on a good maintenance program. Infrequent or inadequate maintenance may result in injuries caused by damaged or worn equipment or surfacing.

CFA	**4.6.1-A**	Manufacturers and/or designers of play equipment shall provide detailed information on inspections, preventive maintenance, and repairs. These instructions shall include at least the following: • Recommendations regarding the a frequency of or a schedule for inspections and preventive maintenance. • Recommendations as to what needs to be inspected and how to inspect those parts. • Recommendations regarding any parts which require special maintenance or which are subject to excessive wear (e.g., swing hangers). • Recommendations as to how preventive maintenance and repairs should be completed. • Instructions how to contact the manufacturer/designer for further information or for repair assistance.
CPSC	**4.6.1-C**	No specific requirement by CPSC.
CFA/CPSC	**4.6.2-B**	The owner/operator and all maintenance or repair personnel shall strictly follow the manufacturer's and/or designer's recommendations for inspection schedules and maintenance instructions.
CFA/CPSC	**4.6.3-B**	The owner/operator shall develop a comprehensive inspection schedule and a related system of maintenance for each play area. This program shall include routine inspections on a regular basis which address the basic safety of the play area and all equipment as well as more thorough inspections which address the construction details of each play component and moving parts or other components that can be expected to wear. The frequency of the routine and more detailed inspections will depend on variables such as the level of use, type of equipment, and climatic conditions. It should be noted, however, that inspections alone do not constitute a comprehensive maintenance program.
CFA/CPSC	**4.6.4-B**	All inspections shall be conducted in a systematic manner by trained personnel.

CFA/CPSC **4.6.5-B** All inspections shall address the provision of protective surfacing under and around all play equipment, checking to ensure that the protective surfacing continues to meet the criteria specified in Section 4.1. This is especially important where loose-fill surfacing materials are used to ensure that the surfacing has not become displaced or compacted in high traffic areas such as under swings and at slide exits.

CFA/CPSC **4.6.6-B** All hazards or damage detected during inspections shall be repaired promptly and in accordance with the manufacturer's and/or designer's instructions for repairs or replacement of parts.

CFA/CPSC **4.6.7-B** The owner/operator of the play area shall retain documentation of inspections, maintenance, and repairs for all equipment. When an inspection is performed, the person performing it should sign and date whatever form is used.

A record of any injuries and deaths reported to have occurred on the playground shall also be collected.

Table 4-5: Sample Checklist for Routine Play Area Inspections[12]

The following table presents suggestions for a routine inspection checklist for play areas. It is intended to address only general maintenance concerns and does not provide for a complete safety evaluation of equipment design and layout.

Owners/operators should use this sample to supplement the manufacturer's and/or designer's recommendations in developing a site-specific checklist. Items such as those listed below should be checked on a weekly basis. Sites with heavy use may warrant routine inspections every other day or even every day.

In addition to routine play area inspections, more detailed inspections of each play equipment component be conducted at least 4 times a year. Sites with heavy use may warrant detailed inspections every other month or even every month. Because the detailed inspections vary according to the individual design and construction of each component, these inspections should carefully follow all manufacturer/designer recommendations for maintenance.

more...

[12]This Table is an adapation of an Appendix in the CPSC *Handbook for Public Playground Safety*.

Sample Checklist for Routine Play Area Inspections

1. **Check for a lack of proper protective surfacing** under and around play equipment. Adequate protective surfacing must be maintained throughout the fall zone for each piece of equipment.
   - For loose surfacing materials, check for any compacting or displacement of materials as well as any potentially hazardous debris that may be hidden beneath the top layer of materials. Loose-fill materials must be maintained at sufficient depth to meet protective surfacing criteria. Give special attention to heavy use areas where compacting and displacement is likely, such as under swings, sliding poles, overhead horizontal ladders, merry-go-rounds, and the exit end of slides.
   - For unitary synthetic materials, check for any damage to the surfacing such as missing, loose, or frayed tiles. Also look for raised edges or other emerging trip hazards.

2. **Check for standing water** which may indicate a drainage problem.

3. **Check play equipment for deterioration and corrosion**.
   - Look for loose splinters, large checks, and decay on wood components.
   - Look for rust and deteriorating paint on metal components.
   - Give special attention to any lead paint that is peeling, cracking, chipping or chalking.
   - Look for splitting or cracking on plastic components.
   - Give special attention to any deterioration and corrosion on structural components which contact the ground; look for any emerging anchoring problems that may cause instability.

4. **Check for any emerging sharp or rough points, corners, or edges**.
   - Give special attention to metal slides, since sharp edges along the sides of the slide chute or at the exit end can be extremely hazardous.
   - Give special attention to merry-go-rounds, since sharp edges along the outer edge of the base can be extremely hazardous.

5. **Check for any emerging protrusions or projections**.
   - Give special attention to missing or damaged protective caps or plugs on hardware and pipe ends.

6. **Check for any exposed moving parts and any pinch, crush or shearing hazards**.
   - Give special attention to potential pinch, crush, and shearing hazards on suspension bridges, tire swing swivels, merry-go-rounds, seesaws, and spring rocking equipment.

7. **Check for loose or worn connecting, covering, or fastening devices as well as loose or worn moving parts**.
   - Give special attention to for swing hangers since they are more susceptible to wear.

8. **Check for potential entanglement hazards**.
   - Give special attention to entanglement hazards caused by open "S" hooks on swings.
   - Give special attention to entanglement hazards caused by protrusions or gaps at the top of slides.

9. **Check for any emerging entrapment hazards** which may be caused, for example, by a missing or damaged component.

10. **Check for emerging trip hazards**, such as exposed footings or rocks, roots, and other obstacles.

11. **Check the play area for damage or possible vandalism**.
    - Look for things such as broken guardrails, missing swing seats, or damaged benches.

12. **Check the entire play area for miscellaneous debris or litter** as well as any hazardous obstacles in the play area.

4.7 General Hazards

Attention to eliminating general hazards on play equipment through both design and maintenance can drastically reduce the frequency of common injuries.

4.7.1 SHARP POINTS, CORNERS, AND EDGES

Because sharp points, corners, and edges -- especially loose splinters -- may be exposed due to wear and tear or weather conditions, frequent inspections to check for any emerging hazards are strongly recommended.

Special attention is warranted for metal slides, since sharp edges along the sides of the slide chute or at the exit end can be extremely hazardous. Similarly, special attention is warranted for merry-go-rounds, since sharp edges along the outer edge of the base can be extremely hazardous.

CFA/CPSC **4.7.1.1-B** All play equipment shall be free of sharp points, corners, and edges which could cause cut or puncture injuries.

CFA/CPSC **4.7.1.2-B** All corners shall be rounded.

CFA/CPSC **4.7.1.3-B** All metal edges shall be rolled or have rounded capping.

CFA/CPSC **4.7.1.4-B** All wood parts shall be smooth and free from splinters.

4.7.2 PROTRUSIONS AND PROJECTIONS; CONNECTING HARDWARE; ENTANGLEMENT HAZARDS

Protrusions and projections, gaps, openings, holes, and other equipment components on play equipment can cause serious injuries or death by strangulation if such hazards can entangle children's clothing or other items around children's necks. Protrusions and projections can also cause serious cut and puncture injuries.

Special attention to protrusions and projections which may present entanglement hazards at the top of slides and caused by open S-hooks and other connecting hardware is warranted. Special attention is also warranted to ensure that there are no dangerous protrusions and projections on swing seats.

Many protrusions and projections can be eliminated through the design of the equipment or by recessing or countersinking potential hazards such as connecting hardware, and most other types of entanglement hazards can also be eliminated through careful design.

CFA/CPSC **4.7.2.1-B** All play equipment shall be free of protrusions and projections, gaps, openings, holes, and other equipment components which could be catch points and could cause entanglement incidents.

> *SAFETY ALERT: CPSC issued a warning about entanglement hazards (see Appendix A). Jackets and sweatshirts with hoods and/or drawstrings, ponchos, attached mittens, and scarves have been implicated in playground-related entanglement incidents that, in several cases, resulted in death by strangulation. Jewelry, such as necklaces and rings, has also been implicated in injuries from entanglement.*

CFA/CPSC **4.7.2.2-B** The diameter of a protrusions shall not increase in the direction away from the surrounding surface towards the exposed end (see Figure 4-4).

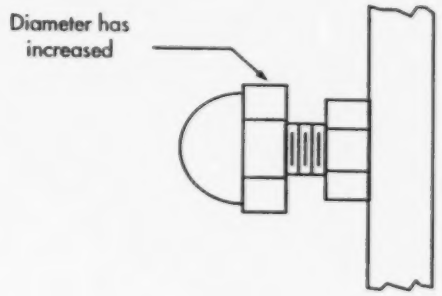


Figure 4-4: Example of a Protrusion Increasing in Diameter from Surrounding Surface to Exposed End[13]

[13] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA	**4.7.2.3-A**	Exposed fasteners shall not extend more than two threads beyond the face of their nut; all such extensions shall be level, smooth, and free of burrs.
CPSC	**4.7.2.3-C**	No specific requirement by CPSC.
CFA	**4.7.2.4-A**	When connecting hardware is covered with caps or any other protective means, the covering device shall extend the length of the hardware and fit flush against the surrounding surface or nut.
CPSC	**4.7.2.4-C**	No specific requirement by CPSC.
CFA/CPSC	**4.7.2.5-B**	The exposed open ends of all tubing not resting on the ground or otherwise covered shall be fitted with caps or plugs that cannot be removed without the use of tools.
CFA/CPSC	**4.7.2.6-B**	All connecting links such as "S" hooks, "C" hooks, or "Pelican" hooks shall be pinched closed as tightly as possible and shall not present any entanglement hazard. A hook is considered closed if there is no gap or space greater than 0.04 inches. It is appropriate to measure the gap with a feeler gauge but, in the absence of such a gauge, the gap should not admit a dime.
CFA/CPSC	**4.7.2.7-B**	**Requirements for Protrusions:** All protrusions and projections, covered or not, shall conform to the performance criterion below, when tested in accordance with the following procedure. **Performance Criterion:** No protrusion may extend beyond the face of any of the three gauges having the dimensions shown in Figure 4-5. **Test Procedure**: Successively place each gauge over any protrusion or projection and determine if it projects beyond the face of the gauge, as shown in Figure 4-6.

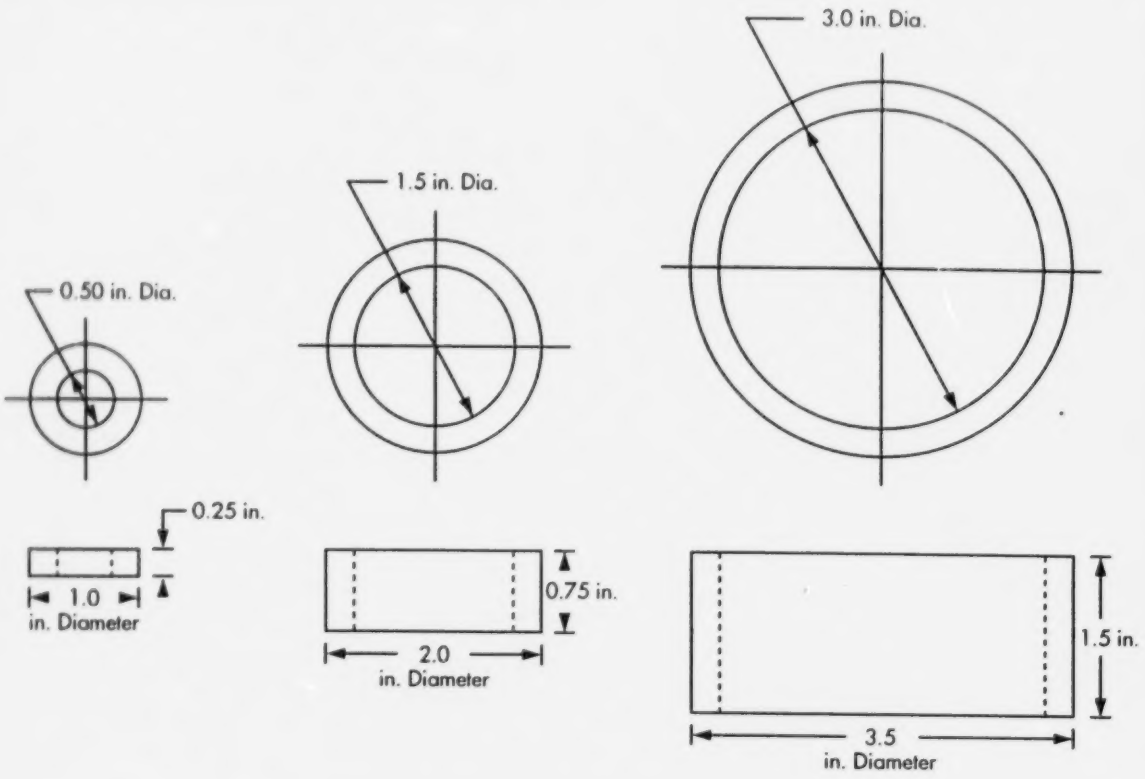


Figure 4-5: Test Gauges for Protrusions and Projections[14]

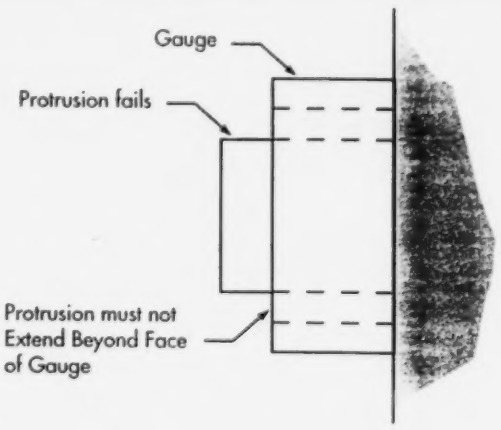


Figure 4-6: Test Procedure for Protrusions and Projections[15]

[14] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.
[15] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA/CPSC **4.7.2.8-B** **Protrusion Requirements for Swings** -- All protrusions and projections on the suspended members of swing assemblies shall conform to the performance criterion below, when tested in accordance with the following procedure.

Performance Criterion: No surface in the potential impact region on suspended members may protrude through the hole beyond the face of a gauge having the dimensions shown in Figure 4-7.

Test Procedure: Conduct the test with the suspended member in its rest position. Place the gauge over any protrusion on the front and rear surface of the suspended member such that the axis of the hole in the gauge is parallel to both the intended path of the suspended member and a horizontal plane. Visually determine if the protrusion penetrates through the hole and beyond the face of the gauge.

Rationale: Protrusions on the suspended members of swing assemblies are a special case, requiring more stringent safety criteria, due to the potential risk of serious injury caused by impact incidents.

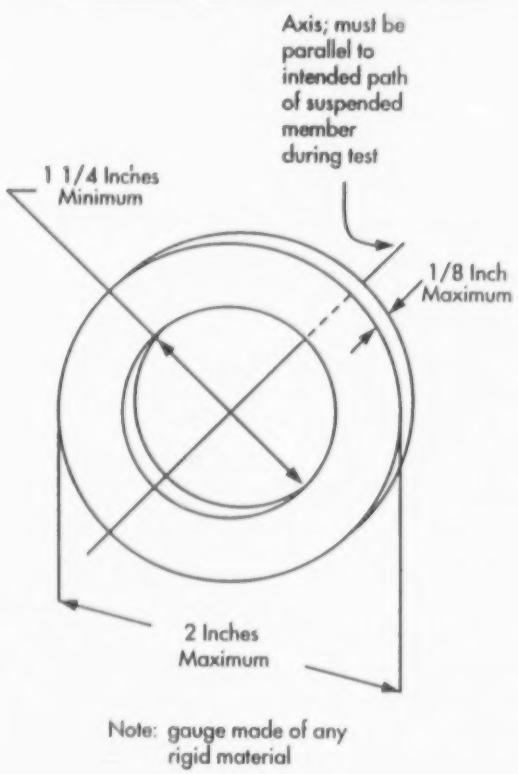

Axis; must be parallel to intended path of suspended member during test
1 1/4 Inches Minimum
1/8 Inch Maximum
2 Inches Maximum
Note: gauge made of any rigid material

Figure 4-7: Test Gauge and Procedure for Protrusions and Projections on Swings[16]

[16] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA/CPSC **4.7.2.9-B** **Protrusion Requirements for Slides** -- All protrusions and projections on the slides shall conform to the performance criterion below, when tested in accordance with the following procedure.

Performance Criterion: No protrusion that fits within any one of the three gauges shown in Figure 4-5 and also has a major axis that projects upwards from a horizontal plane may have a projection perpendicular to the plane of the surrounding surface greater than 1/8 inch, as shown in Figure 4-8. In addition, if a protrusion on a slide falls with the clear zone shown in Figure 4-9, this 1/8 inch criterion applies regardless of the protrusion's orientation.

NOTE: The underside of a slide chute is not subject to this performance criterion (Section 4.7.2.9) but is subject to the general protrusion requirements (Section 4.7.2). For a slide chute with a circular cross-section, the portion of the underside not subject to this performance criterion is shown in Figures 5-3 and 6-3.

Test Procedure: Successively place each of the three protrusion test gauges over any protrusion on the slide. For any protrusion that fits within any of the gauges, determine whether the protrusion is located in the required clear zone. If a protrusion is not located in the clear zone, visually determine whether the protrusion has a major axis projecting upward from the horizontal; if so, then measure its projection from the surrounding surface to establish whether it exceeds 1/8 inch. For protrusions located in the clear zone, measure the projection of the protrusion from its surrounding surface to establish whether it exceeds 1/8 inch.

Rationale: Protrusions on slides are a special case, requiring more stringent safety criteria, due to the potential risk of serious injury or death by strangulation caused by entanglement incidents.

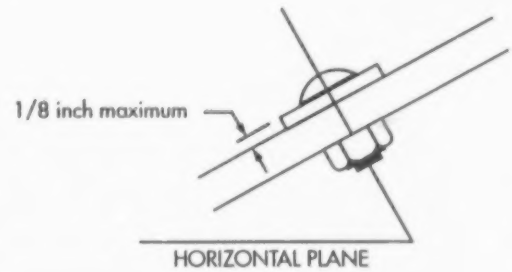


Figure 4-8: Protrusion Facing Upward[17]

[17] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

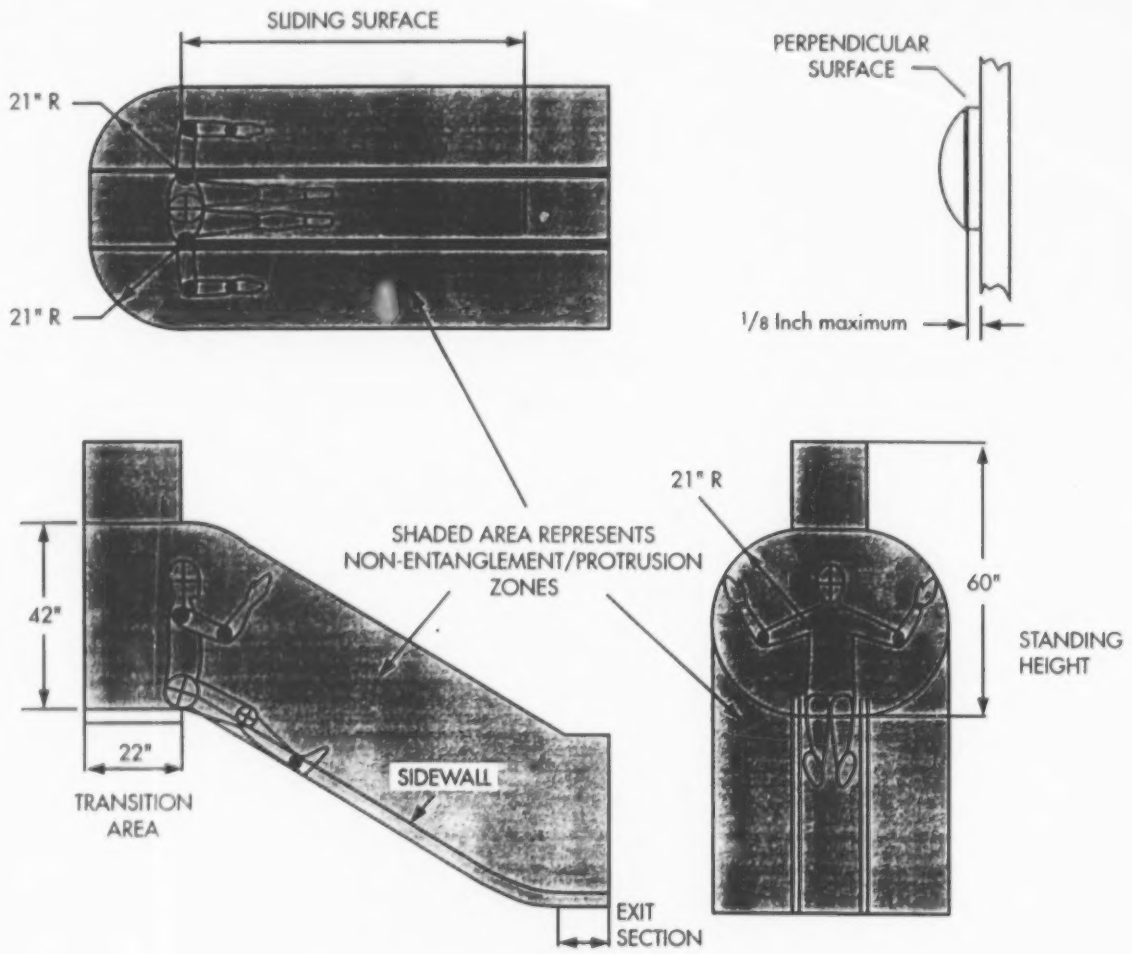


Figure 4-9: Clear Zone on Slides Subject to Protrusion Requirements[18]

BEST COPY AVAILABLE

[18] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

4.7.3 PINCH, CRUSH, AND SHEARING POINTS; MOVING PARTS

Special attention to potential pinch, crush, and shearing hazards on suspension bridges, tire swing swivels, merry-go-rounds, seesaws, and spring rocking equipment is warranted.

CFA/CPSC **4.7.3.1-B** All play equipment shall be free of accessible pinch, crush, and shearing points that could injure children or cause entanglement incidents.

Such points can be caused by components moving relative to each other or to a fixed component when the equipment moves through its anticipated use cycle. To determine if there is a possible pinch, crush, or shearing point, consider the likelihood of entrapping a body part of the smallest intended user together with the configuration and closing force of the components.

CFA **4.7.3.2-A** All moving parts shall be designed to prevent pinch, crush, and shearing points or be enclosed to prevent access.

CPSC **4.7.3.2-C** No specific requirement by CPSC.

4.7.4 HEAD AND NECK ENTRAPMENT

Head and neck entrapment present a very serious risk of death by strangulation for young children and, therefore, warrants extra precaution. Entrapment may occur when a child attempts to enter an opening either head first or feet first. Entrapment by head first entry generally occurs when children place their heads through an opening in one orientation, then, after turning their heads to a different orientation, they are unable to withdraw from the opening. Entrapment by feet first entry generally occurs when children who are sitting or lying down slide their feet into an opening that is large enough to permit passage of their bodies but is not large enough to permit passage of their heads.

The entrapment criteria apply to all openings regardless of their height above ground, because even if young children can reach the ground they may not have the cognitive or motor abilities necessary to extricate their heads, particularly if they are scared or panicked, and are, therefore, still at risk of strangulation.

CFA/CPSC **4.7.4.1-B** A component or group of components shall not form openings that could trap a child's head. In general, an opening may present an entrapment hazard if the distance between any interior opposing surfaces is greater than 3.5 inches and less than 9 inches. When one dimension of an opening is within the potentially hazardous range, all dimensions of the opening shall be considered together to fully evaluate the possibility of entrapment.

SAFETY ALERT: Head entrapment is a known cause of playground-related deaths by strangulation. Younger children are at highest risk for head entrapment incidents because they do not have the necessary cognitive and physical skills to extricate themselves if they do get entrapped. Entrapment can occur through either head-first or feet-first entry into a dangerous opening. To prevent entrapment, an opening must be either small enough (less than 3.5 inches) to prevent a child's body or head from entering it or large enough (greater than 9 inches) to allow a child's body and head to pass through it freely.

This entrapment requirement applies to all completely-bounded openings (see Figure 4-10) except where the ground serves as an opening's lower boundary. Further, this requirement applies to all openings in either the horizontal or vertical plane regardless of their height above ground. All play equipment, whether designed for preschool-age or school-age children are subject to the entrapment requirements. Both stationary equipment and moving equipment (in its stationary position) shall be tested.

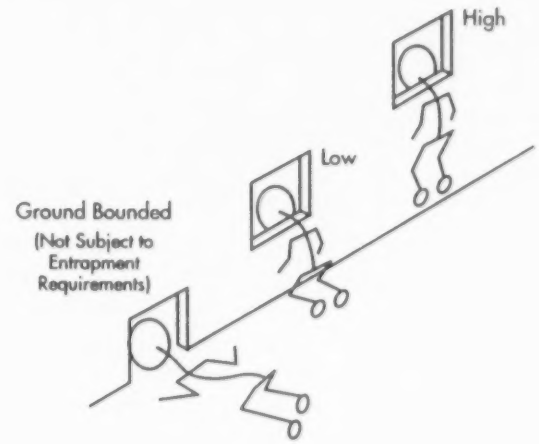


Figure 4-10: Examples of Completely-Bounded Openings[19]

[19] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA/CPSC **4.7.4.2-B** **Entrapment Requirements**: The most appropriate way to determine whether an opening presents an entrapment hazard is to evaluate it using the test fixtures, performance criteria, and test procedure described below.

Test Fixtures

- The Small Torso Template is illustrated in Figure 4-11.
- The Large Head Template is illustrated in Figure 4-12.

Performance Criteria

- When tested in accordance with the following procedure, an opening conforms to the entrapment requirement if:
  (1) the opening does not admit the Small Torso Template,
  or
  (2) the opening admits the Small Torso Template and also admits the Large Head Template.
- An opening fails to conform to the entrapment requirement if it admits the Small Torso Template but does not admit the Large Head Template.

Test Procedure (see Figure 4-13)

- Attempt to place the Small Torso Template in the opening with the plane of the template parallel to the plane of the opening. While keeping it parallel to the plane of the opening, rotate the template to its most adverse orientation (i.e., so that the major axis of the template is parallel to the major axis of the opening).
- If the Small Torso Template can be freely inserted through the opening, place the Large Head Template in the opening, again with the plane of the template parallel to the plane of the opening, and attempt to freely insert it through the opening.

Rationale: The dimensions of the Small Torso Template are based on the size of the torso of the smallest child at risk of entrapment. If an opening is too small to admit this template, it is also too small to permit feet-first entry by a child. In addition, because children's heads are larger than their torsos, an opening that does not admit the Small Torso Template will prevent head-first entry by a child.

The dimensions of the Large Head Template are based on the largest dimensions on the head of the largest child at risk of entrapment. If an opening is large enough to permit free passage of this template, it is large enough to permit free passage of the head of the largest child at risk in any orientation. In addition, openings large enough to permit free passage of the Large Head Template will not entrap a child's chest.

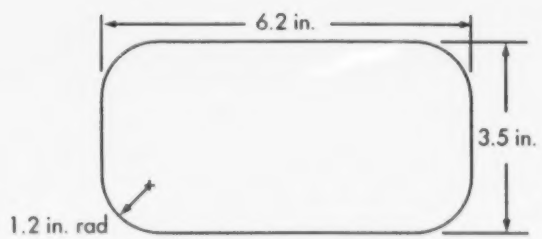


Figure 4-11: Small Torso Template[20]

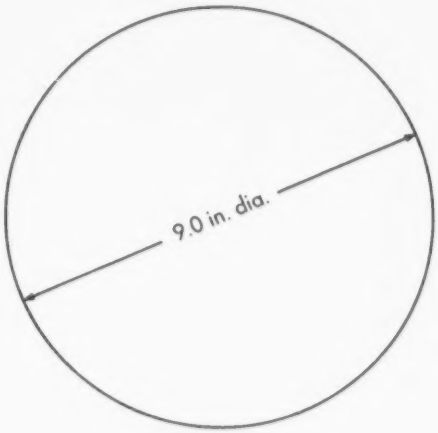
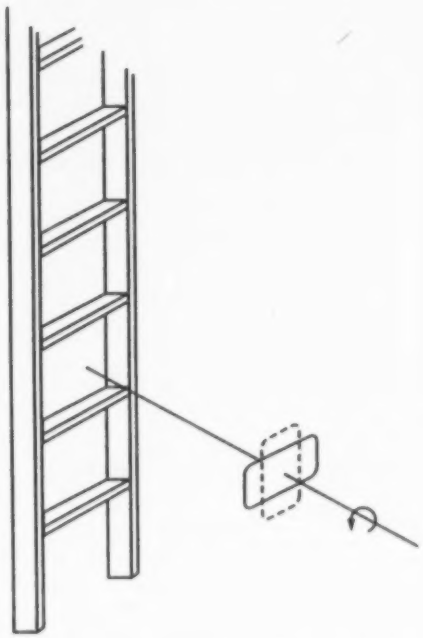


Figure 4-12: Large Head Template[21]

[20] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.
[21] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.



Test procedures and performance criteria for completely-bounded openings.

Place the Small Torso Template in the opening with the plane of the template parallel to the plane of the opening. Rotate the template while keeping it parallel to the opening.

If the Small Torso Template can be inserted into the opening, place the Large Head Template into the opening so its plane is parallel to the plane of the opening.

An opening can pass this test when tested in accordance with the above procedures in one of two ways: 1) the opening does not admit the Small Torso Template when it is rotated to any orientation about its own axis, or 2) the opening admits the Small Torso Template and also admits the Large Head Template. An opening fails the test under the following conditions: the opening admits the Small Torso Template but does not admit the Large Head Template.

Figure 4-13: Test Procedure for Completely-Bounded Openings[22]

[22] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA/CPSC **4.7.4.3-B** **Entrapment Requirements for Non-Rigid Openings:** The most appropriate way to determine whether a non-rigid opening presents an entrapment hazard is to evaluate it using the test fixtures, performance criteria, and test procedure described below.

Test Fixtures for Non-Rigid Openings

- The Small Torso Probe is illustrated in Figure 4-14.
- The Large Head Probe is illustrated in Figure 4-15.

Performance Criteria for Non-Rigid Openings

- When tested in accordance with the following procedure, a non-rigid opening conforms to the entrapment requirement if:
  (1) the opening does not allow complete passage of the Small Torso Probe,
  or
  (2) the opening allows complete passage of the Small Torso Probe as well as of the Large Head Probe.
- A non-rigid opening fails to conform to the entrapment requirement if it allows complete passage of the Small Torso Probe but does not allow complete passage of the Large Head Probe.

Test Procedures for Non-Rigid Openings

- Place the Small Torso Probe in the opening, tapered end first, with the plane of its base parallel to the plane of the opening. While keeping its base parallel to the plane of the opening, rotate the probe to its most adverse orientation (i.e., so that the probe's major axis is parallel to the opening's major axis). Determine whether the probe can be pushed or pulled through the opening by a force no greater than 50 pounds.
- If the Small Torso Probe passes completely through the opening, place the Large Head Probe in the opening with the plane of its base parallel to the plane of the opening. Attempt to push or pull the probe through the opening with a force no greater than 50 pounds.

Rationale: Climbing components, such as flexible nets, are a special case for the entrapment tests because the size and shape of openings on such components can be altered when force is applied, either intentionally or simply when a child climbs on or falls through the openings. Children are then at risk of entrapment in these distorted openings.

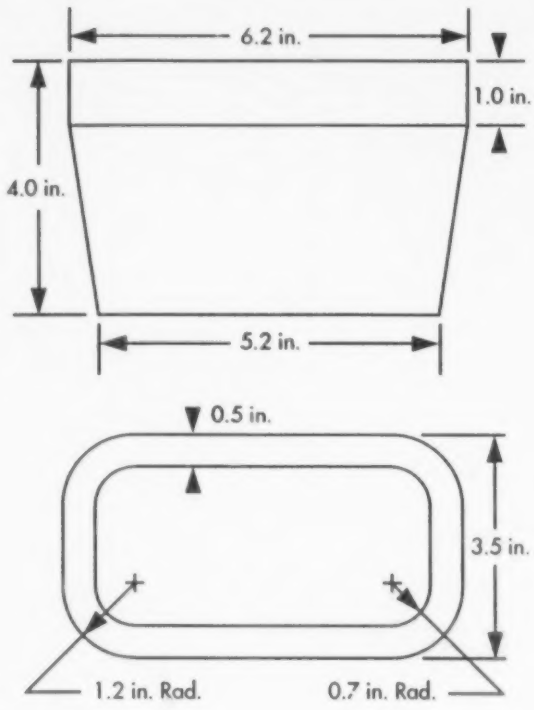


Figure 4-14: Small Torso Probe[23]

[23] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

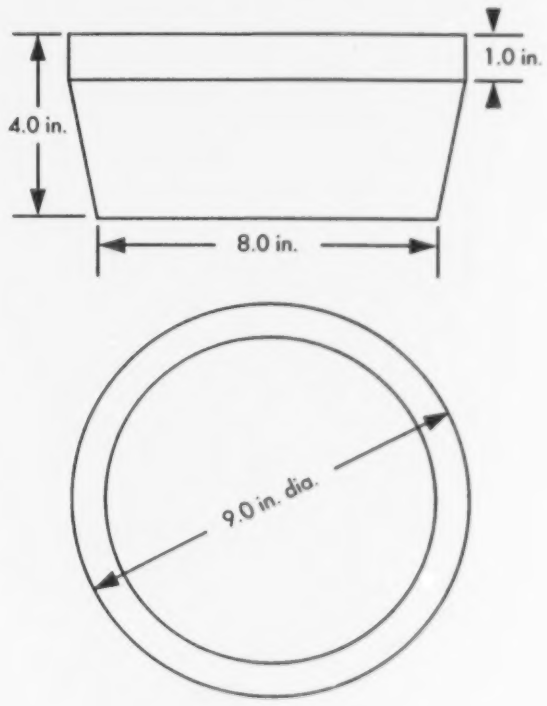


Figure 4-15: Large Head Probe[24]

[24] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA/CPSC **4.7.4.4-B** **Entrapment Requirements for Completely-Bounded Openings with Limited Depth:** The configuration of some openings may be such that the depth of penetration is a critical issue for determining the entrapment potential (see Figure 4-16). This case involves openings in two different planes, each of which has the potential to entrap a child and, therefore, shall be tested.

Figure 4-17 shows examples of this type of opening for a step ladder with a barrier behind it as well as generically. Plane A is the plane of the completely-bounded opening in question. Plane B is the plane of the opening encompassing the horizontal space between the lower boundary of the opening in Plane A and the barrier. Both of these openings shall be tested according to the following performance criteria and test procedures, which depend on the series of questions described below.

Rationale: Consider a vertical wall or some other barrier behind a step ladder. The entrapment potential depends not only on the dimensions of the opening between adjacent steps but also on the depth of that opening, which is the horizontal space between the lower boundary of the opening and the barrier. A child may enter the opening between adjacent steps feet first and then attempt to pass through the space between the rear of the lower step and the barrier but become entrapped if the child's head is unable to pass through either of these openings.

Performance Criteria and Test Procedures for Completely-Bounded Openings with Limited Depth

- Determine whether or not the smallest child at risk can enter the opening in Plane A.

  If the opening in Plane A does not admit the Small Torso Template in any orientation, then the opening is small enough to prevent either head-first or feet-first entry by the smallest child at risk and is not an entrapment hazard. The opening conforms to the requirements. Stop.

  If the opening in Plane A admits the Small Torso Template, then the smallest child at risk can enter the opening in Plane A. The entrapment potential depends on whether or not the smallest child at risk can also enter the opening in Plane B. Continue.
- Does the opening in Plane B admit the Small Torso Template?

  If the opening in Plane B does not admit the Small Torso Template, then it is small enough to prevent either head-first or feet-first entry by the smallest child at risk. Therefore, the depth of penetration into the opening in Plane A is insufficient to result in entrapment of the smallest child at risk. The opening conforms to the requirements. Stop.

  If the opening in Plane B admits the Small Torso Template, then the smallest child at risk can enter the opening in Plane B feet first. The entrapment potential depends on whether or not the largest child at risk can exit the opening in Plane A. Continue.

- Does the opening in Plane A admit the Large Head Template?

  If the opening in Plane A does not admit the Large Head Template, then a child whose torso can enter the opening in Plane A as well as the opening in Plane B may become entrapped by the head in the opening in Plane A. The opening fails to conform to the requirements. Stop.

  If the opening in Plane A admits the Large Head Template, then the largest child at risk can exit the opening in Plane A. The entrapment potential depends on whether the largest child at risk can also exit the opening in Plane B. Continue.

- Does the opening in Plane B admit the Large Head Template?

  If the opening in Plane B does not admit the Large Head Template, then the largest child at risk cannot exit the opening in Plane B. This presents an entrapment hazard because a child's torso may enter the openings in Plane A and Plane B and a child's head may pass through the opening in Plane A but then become entrapped in the opening in Plane B. The opening fails to conform to the requirements. Stop.

  If the opening in Plane B admits the Large Head Template, then the largest child at risk can exit the opening in Plane B, so there is no entrapment hazard. The openings in both Plane A and Plane B conform to the requirements.

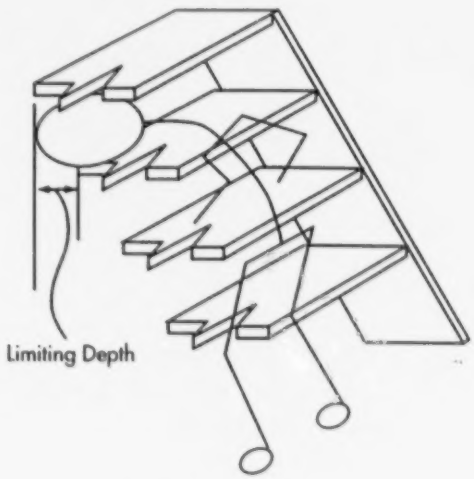


Figure 4-16: Completely-Bounded Openings with Limited Depth[25]

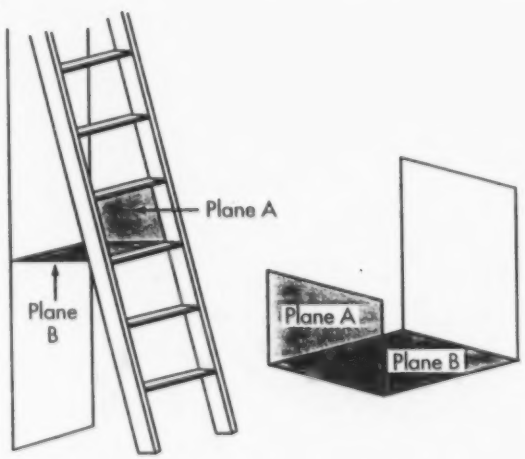
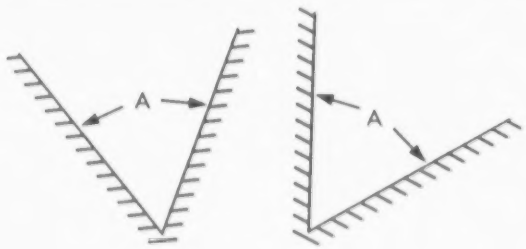


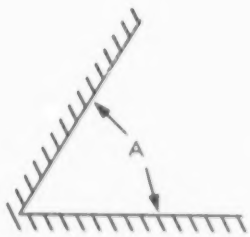
Figure 4-17: Examples of Completely-Bounded Openings Where Depth of Penetration is a Critical Issue[26]

[25] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.
[26] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA/CPSC **4.7.4.5-B** **Angles** -- The angle of any vertex formed by adjacent components shall not be less than 55 degrees, unless the lower leg is horizontal or projects downwards (see Figure 4-18). An exception to this requirement can be made if a rigid shield is attached to the vertex between adjacent components and the shield is of sufficient size to prevent a 9-inch circular template (such as the Large Head Template described above and illustrated in Figure 4-12) from simultaneously touching components on either side of the vertex, as illustrated in Figure 4-19.



Angle A should exceed 55°



Angle A is not subject to the greater than 55° recommendation if one leg of the vee is horizontal or slopes downward from the apex

Figure 4-18: Requirements for Angles[27]

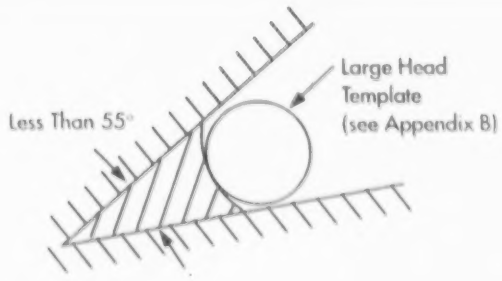


Figure 4-19: Shield for Angles Less than 55 Degrees[28]

[27] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.
[28] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

4.7.5 TRIP HAZARDS

CFA	**4.7.5.1-A**	The play area shall be free of obstacles which may cause children to trip.
CPSC	**4.7.5.1-C**	No specific requirement by CPSC.
CFA/CPSC	**4.7.5.2-B**	All environmental obstacles, such as rocks, roots, and any other protrusions from the ground shall be removed from the play area.
CFA/CPSC	**4.7.5.3-B**	All anchoring devices for play equipment shall be installed below ground level beneath the base of the protective surfacing material to eliminate trip hazards. *Rationale: In addition to preventing actual tripping, the above requirement will also help prevent children who do fall from sustaining injuries due to impact with structural components.*
CFA/CPSC	**4.7.5.4-B**	All retainer walls used to contain loose surfacing materials shall be highly visible and any changes of elevation shall be obvious. *Rationale: Children are more likely to notice retainer walls and, therefore, less likely to trip when the wall is highly visible and they must consciously climb over it. Elevations from both directions of travel can help accomplish this design goal. The use of bright colors can also increase the visibility of retainer walls and minimize trip hazards.*

4.7.6 SUSPENDED HAZARDS

CFA/CPSC	**4.7.6.1-B**	Cable, wires, ropes, and other flexible components suspended between play units or from the ground to a play unit within 45 degrees of horizontal shall not be located in areas of high traffic. It is also recommended that any suspended members allowed by this requirement either be brightly colored or contrast with the surrounding equipment to add to their visibility. This requirement does not apply to suspended members located 7 feet or more above the play surface. *Rationale: This requirement is intended to eliminate suspended hazards that may present a tripping hazard and/or cause injuries to a running child.*

CFA	**4.7.6.2-A**	Any suspended members allowed by the above requirement shall be fixed at both ends so that they cannot loop back on themselves and have a minimum diameter of 1 inch at their smallest cross-section. *Rationale: This requirement is intended to eliminate cables, wires, ropes, and other flexible components that may cause strangulation incidents.*
CPSC	**4.7.6.2-C**	No specific requirement by CPSC.

4.7.7 ELECTRICAL HAZARDS

CFA	**4.7.7.1-A**	The play area shall be free of electrical hazards. Electrical hazards include but are not limited to accessible electrical switch boxes, utility meters, air conditioners, and any other electrical equipment. Where such equipment is necessary, it shall be secured from children's access by locked enclosures.
CPSC	**4.7.7.1-C**	No specific requirement by CPSC.
CFA	**4.7.7.2-A**	All electrical wiring shall be located beyond the reach of children climbing on the play equipment or in trees.
CPSC	**4.7.7.2-C**	No specific requirement by CPSC.

Section 5

SAFETY AND DESIGN REQUIREMENTS FOR PLAY AREAS INTENDED FOR USE BY PRESCHOOL-AGE CHILDREN

5.1 Climbing Components
5.1.1 General Requirements
5.1.2 Ramps
5.1.3 Stairways, Step Ladders, and Rung Ladders
5.1.4 Spiral Stairways
5.1.5 Arch Ladders
5.1.6 Climbing Events with Flexible Components
5.1.7 Sliding Poles
5.1.8 Turning or Chinning Bars
5.1.9 Parallel Bars
5.1.10 Overhead Horizontal Ladders
5.1.11 Overhead Rings
5.1.12 Track Rides
5.1.13 Climbing Ropes
5.1.14 Suspension Bridges
5.1.15 Balance Beams
5.1.16 Chain or Cable Walks

5.2 Hand-Gripping Components
5.2.1 Handrails
5.2.2 Others Handholds
5.2.3 Diameter of Hand-Gripping Components

5.3 Platforms and Other Elevated Play Surfaces
5.3.1 General Requirements
5.3.2 Guardrails and Protective Barriers
5.3.3 Stepped Platforms

5.4 Slides
5.4.1 Access to Slides and Slide Platforms
5.4.2 Slide Chute Entrance
5.4.3 Sliding Surface
5.4.4 Exit Region

5.5 Swings
5.5.1 General Requirements
5.5.2 Single-Axis Swings
5.5.3 Multiple-Axis Swings

5.6 Rotating Equipment
5.6.1 Swinging Gates
5.6.2 Log Rolls
5.6.3 Merry-Go-Rounds

5.7 Seesaws
5.7.1 Traditional Fulcrum Seesaws
5.7.2 Spring-Loaded Seesaws

5.8 Spring Rocking Equipment
5.8.1 Springs
5.8.2 Seat Assemblies
5.8.3 Spring Platforms

Important Note:

This document contains numbered items which are **requirements** that could be adopted as law. In some cases, CFA provides **rationale** for the requirement, shown in italicized text immediately the requirement. Where appropriate, CFA also give introductory comments and explanations at the beginning of major sections. In some general content areas, CFA offers additional information, intended as guidance only not as requirements.

Each requirement has its own identification number and is labeled with an **A**, **B**, or **C**. The labeling codes are as follows.

- Requirements labeled with an **A** are specifications of **CFA only**.
- Requirements labeled with a **B** are specifications of both **CFA and CPSC**.
- Requirements labeled with a **C** are specifications of **CPSC only**.

In order to follow the similarities and differences between the CFA and CPSC requirements, pay close attention to the numbers assigned to each requirement For every CFA model law provision, we have noted whether CPSC has the same requirement, a different requirement, or no requirement. This CFA report addresses every issue addressed by the 1997 CPSC handbook; the majority of these provisions are the same. However, CFA also addresses a substantial number of issues not addressed by CPSC. So for each requirement, there are three possibilities with respect to CFA and CPSC versions, as follows.

- In many cases, CFA and CPSC recommend the same specification. A requirement included by both CFA and CPSC will appear only once and its identification number will be labeled with a **B**.
- Where CFA and CPSC both address the same issue but the CFA specification is more stringent, the CFA and CPSC requirements are each given the same identification number but the CFA version is labeled with an **A** while the CPSC version is labeled with a **C**.
- Where CFA addresses an issue that is not addressed by CPSC, again there are **A** and **C** versions for the same identification number. The **A** specification provides CFA's requirement while the **C** specification indicates "No specific requirement by CPSC."

There are no cases in which a CFA and CPSC requirement conflict. If a piece of play equipment or play area complies with all CFA specifications, it also complies with all CPSC specifications. However, a piece of play equipment or play area could comply with all CPSC specifications without complying with all CFA specifications because CFA addresses additional issues or is more stringent in some cases.

To adopt all CFA specifications, adopt requirements labeled with either an A or B. This approach would include a complete representation of the 1997 CPSC guidelines while also going beyond the scope of CPSC to address additional content areas and to provide more stringent specifications in some areas. It is important to recognize that CFA makes many more developmental distinctions than CPSC, providing different requirements for preschool-age and school-age children.

To adopt all CPSC specifications but not additional or more stringent CFA specifications, adopt requirements labeled with either a B or C. Because all CPSC specifications are included in this document, this approach would include a complete representation of the 1997 CPSC guidelines.

5.1 Climbing Components

Most climbing components serve as a means of access to or egress from another play event or events on a composite structure. Some, however, may also be designed as separate play events.

Climbing components vary greatly in their level of challenge. The least challenging climbing components include: ramps, stairways, step ladders, stepped or layered platforms, stepping timbers, balance beams, tunnels, and solid bridges. Climbing components that present an intermediate challenge include: rung ladders, suspension bridges, chinning bars, parallel bars, and dome climbers. Structures that require more advanced coordination and balance for successful climbing and, therefore, present greater challenges include: arch ladders, tire climbers, net climbers, and sliding poles. In addition, because upper body equipment such as overhead horizontal ladders and overhead rings require children to support all of their weight with their hands (as compared to other climbing components which allow foot support as well), they can be especially difficult to maneuver -- children under 4 usually cannot fully negotiate upper body equipment.

5.1.1 GENERAL REQUIREMENTS

CFA **5.1.1.1-A** All play areas shall provide a range of challenge with a variety of climbing components.

Rationale: When children can make choices and select play events suited to their individual skill levels, they are less likely to get hurt.

CPSC **5.1.1.1-C** No specific requirement by CPSC.

CFA/CPSC **5.1.1.2-B** Climbing equipment shall allow children to descend as easily as they ascend. To do so, play equipment shall offer multiple means of access/egress of varying challenge. For example, a stairway can provide a less challenging egress option while a vertical rung ladder provides a more challenging access option.

Rationale: This design strategy contributes to safer use of both composite structures and separate play events, particularly free-standing slides. Offering an easy way out is particularly important for preschool-age children, since the ability to descend a specific climbing component often emerges later the ability to climb up the same component.

CFA/CPSC **5.1.1.3-B** Composite structures shall be designed so that the mode of use, level of challenge, and play and traffic patterns of adjacent components are compatible.

CFA	**5.1.1.4-A**	Climbing equipment shall not have any obstructions, climbing rungs, or structural components on the interior of the structure which could interrupt a fall to the protective surfacing below and cause an impact injury. *Rationale: Falls onto rigid components from any height can cause serious injuries.* *Note: This requirement is intended to eliminate the old-style multi-tiered, cubical "jungle gyms."*
CPSC	**5.1.1.4-C**	Climbers shall not have any climbing bars or other structural components in the interior of the structure onto which a child may fall from a height of greater than 18 inches.
CFA	**5.1.1.5-A**	The fall height of climbing equipment -- which is the height of the highest climbing component -- shall not exceed 4 feet above the protective surfacing. *Rationale: Limiting potential fall heights is critical, because most climbing equipment-related injuries are caused by falls and because falls cause the most serious injuries.*
CPSC	**5.1.1.5-C**	No specific requirement by CPSC.
5.1.2	**RAMPS**[29]	
CFA/CPSC	**5.1.2.1-B**	**Access Slope** -- The slope of ramps shall not exceed 1 foot to 8 feet (vertical to horizontal). *Rationale: This maximum slope for ramps is consistent with BOCA National Building Codes. It is not, however, intended to address ramps designed for disabled access.*
CFA/CPSC	**5.1.2.2-B**	**Width** • Ramps intended for single-file use shall be at least 12 inches wide. • Ramps intended for use by more than one child at a time shall be at least 30 inches wide.

[29]These specifications for ramps are not intended to address ramps used for compliance with the ADA and access by disabled children. Instead, they are intended only for ramps designed as climbing components.

Rationale: The minimum width for single-file ramps is based on the shoulder breadth of the largest user; the shoulder breadth of a 95th percentile 5-year-old is 11.5 inches. The minimum width for ramps for use by more than one child at a time is based on twice the shoulder breadth of the largest user plus an allowance for space between children.

5.1.3 STAIRWAYS, STEP LADDERS, AND RUNG LADDERS

Stairways, step ladders, and rung ladders are distinguished by the range of slopes permitted for each of these types of access. With increasing slope, challenge also increases.

Stairways have steps intended primarily for foot support. Step ladders also have steps, but due to their steeper slopes, are intended to require foot support as well as a limited degree of hand support -- there is more climbing involved when negotiating a step ladder than a stairway. Rung ladders require even more climbing, and the rungs are intended to be used for both hand and foot support.

CFA	**5.1.3.1-A**	All steps and rungs shall be securely attached to their side supports and shall not turn or wobble when stepped on or grasped.
CPSC	**5.1.3.1-C**	No specific requirement by CPSC.
CFA	**5.1.3.2-A**	All steps and rungs shall be horizontal within a tolerance of ± 2 degrees.
CPSC	**5.1.3.2-C**	No specific requirement by CPSC.
CFA/CPSC	**5.1.3.3-B**	When risers on stairways or stepladders are closed, their design shall allow for drainage and prevent the accumulation of debris. Drainage holes shall preclude finger entrapment and pinching.
CFA/CPSC	**5.1.3.4-B**	All steps and rungs on stairways and ladders shall be evenly spaced. This requirement also applies to the distance between the top step or rung and the underside of the platform it serves.
CFA/CPSC	**5.1.3.5-B**	**Access Slope** • Stairways shall have slopes no greater than 35 degrees. • Step ladders shall have slopes between 50 and 75 degrees. • Rung ladders shall have slopes between 75 and 90 degrees.

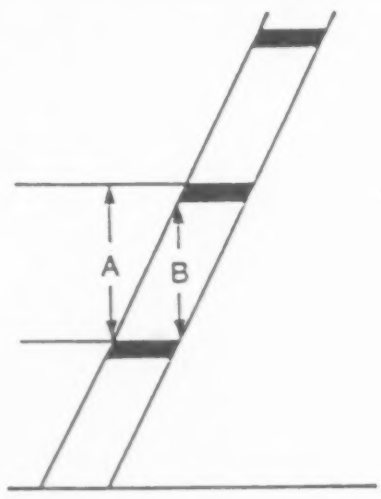
CFA/CPSC **5.1.3.6-B** **Vertical Rise** -- Vertical rise is the tread-to-tread distance between two consecutive steps or rungs. The same requirements apply to the distance between the top step or rung and the underside of the platform it serves.

On stairways and step ladders, vertical rise shall not exceed 9 inches (see Figure 5-1). Unless the distance between interior opposing surfaces of consecutive steps is less than 3.5 inches, all risers shall be closed to conform with the entrapment criteria (see Section 4.7.4).

On rung ladders, vertical rise shall not be greater than 12 inches (see Figure 5-1). To satisfy the entrapment criteria (see Section 4.7.4) and because the design of rung ladders does not allow closed risers, the distance between interior opposing surfaces of consecutive rungs shall not be between 3.5 and 9 inches.

Rationale: The vertical rise of steps shall simultaneously meet two criteria:
(1) The distance between interior opposing surfaces of consecutive steps as well as the distance between the top step and the underside of the platform it serves shall preclude the possibility of entrapment. Entrapment criteria prohibit openings with an interior dimension between 3.5 and 9 inches.
(2) The distance between the top surfaces of consecutive steps shall not exceed the step height of the smallest user. The step height of a 5th percentile 2-year-old is 8.7 inches.

Rung ladders shall also satisfy entrapment criteria; however, the vertical rise may slightly exceed the step height of the smallest user since rung ladders are intended to be climbed using both hand and foot support.



A is the vertical rise between consecutive steps or rungs, which is the vertical distance from tread to tread.

B is the distance between interior opposing surfaces of consecutive steps or rungs, which is subject to entrapment requirements.

Stairways and Stepladders
For preschool-age children, **A** must not exceed 9 inches and unless **B** is smaller than 3.5 inches the openings between steps must be closed to preclude entrapment.

Rung Ladders
For preschool-age children, **A** must not exceed 12 inches and **B** must not be between 3.5 inches and 9 inches to preclude entrapment.

Figure 5-1: Vertical Rise Criteria[30]

[30] This Figure is an adaptation of a Figure in the Comsis Report (Ratté et al., 1990).

CFA/CPSC **5.1.3.7-B** **Tread or Rung Width**

- Stairways intended for single-file use shall be at least 12 inches wide.
- Stairways intended for use by more than one child at a time shall be at least 30 inches wide.
- Step ladders shall be between 12 and 21 inches wide.
- Rung ladders shall be at least 12 inches wide.

Rationale: The minimum tread and rung widths are based on the shoulder breadth of the largest user; the shoulder breadth for a 95th percentile 5-year-old is 11.5 inches.

Because children essentially walk up stairways and do not need hand support on both sides, young children can manage wider stairways. For stairways intended for use by more than one child at a time, the minimum width is based on twice the shoulder breadth of the largest user plus an allowance for space between children.

A maximum width is specified for step ladders because the availability of hand support on both sides is critical for preschool-age children while climbing up steeper inclines (as compared to walking up stairways). If handrails are too far apart, young children may not be able to employ sufficient force in trying to pull themselves up stepladders in a vertical direction. The 21-inch maximum width ensures that the minimum user can make use of the handrails on both sides of a step ladder. This value corresponds the shoulder breadth of a 5th percentile 2-year-old (8.7 inches) plus an allowance on each side for the acromion-radiale length (5.9 inches), which approximates the distance between elbows when the arms are extended out from the shoulder.

No maximum is specified for rung ladders since their intended use involves both hand and foot support which can be provided by the rungs themselves.

CFA/CPSC **5.1.3.8-B** **Tread Depth** -- On stairways and step ladders, for both open and closed risers, tread depth shall be at least 7 inches.

Rationale: Because preschool-age children have a less-developed sense of balance as well as less upper body strength, the requirements for tread depth are conservative, allowing for almost full support of the largest user's foot. The length of a 95th percentile 5-year-old's foot is 7.2 inches.

CFA/CPSC **5.1.3.9-B** **Rung Diameter** -- Rungs shall meet the general requirements for the diameter of hand-gripping components (see Section 5.2.3).

5.1.4 SPIRAL STAIRWAYS

CFA **5.1.4.1-A** Spiral stairways shall meet the general criteria above for straight stairways as well as those regarding slope, vertical rise, and tread width (see Sections 5.1.3.1 through 5.1.3.7).

CPSC **5.1.4.1-C** No specific requirement by CPSC.

CFA **5.1.4.2-A** Tread depth at the outer edge of steps on a spiral stairway shall be at least 7 inches.

Rationale: When combined with requirements for tread width, the above requirement ensures that children have an adequate contact area for their feet when climbing spiral stairways.

CPSC **5.1.4.2-C** No specific requirement by CPSC.

5.1.5 ARCH LADDERS

Arch ladders consist of metal rungs or wood members attached to convex side supports.

CFA/CPSC **5.1.5.1-B** Free-standing arch ladders shall not be included in play areas designed for preschool-age children. Only arch ladders that are designed as an access/egress component may be included in play areas designed for preschool-age children.

Rationale: Arch ladders are considered to be one of the more challenging climbing components. On free-standing arch ladders, young children may get stuck in a "no way out" situation because the ability to ascend a climbing structure may develop before the ability to descend the same structure. In addition, young children may not have developed the cognitive ability to reverse their actions yet. So young children may be able to get up to the top of the arch ladder but then be unable to get back down safely. If the child gets scared or panicky, this "no way out" situation may contribute to a fall.

CFA/CPSC **5.1.5.2-B** Arch ladders shall not be the sole means of access to play equipment.

Rationale: Arch ladders are considered to be one of the more challenging climbing components. Providing a less challenging mode of access/egress, such as a stairway or step ladder, will ensure that younger children use the

arch ladder because they want to assume its challenge not because they are forced to use it.

CFA **5.1.5.3-A** The top climbing member of an arch ladder shall be no higher than 3 feet above the protective surfacing.

Rationale: Given the added challenge of arch ladders, a lower maximum fall height is warranted since falls are common during the transitions from climbing an access/egress component to standing on the platform.

CPSC **5.1.5.3-C** No specific requirement by CPSC.

CFA **5.1.5.4-A** The top climbing member of an arch ladder used as an access/egress component shall be at or below the level of the platform it serves.

Rationale: This requirement is intended to facilitate the transition from climbing to standing. If the top member of an arch ladder used as an access/egress component is located above the platform it serves, children may have difficulty making this transition and will be at increased risk of falls.

CPSC **5.1.5.4-C** No specific requirement by CPSC.

CFA/CPSC **5.1.5.5-B** The openings formed by the climbing members of an arch ladder shall conform to the entrapment criteria (see Section 4.7.4).

CFA/CPSC **5.1.5.6-B** Rungs used on arch ladders shall conform to the general requirements for the diameter of hand-gripping components (see Section 5.2.3).

5.1.6 CLIMBING EVENTS WITH FLEXIBLE COMPONENTS

Play events such as net or chain climbers (which consist of a grid of cables or chains) or tire climbers (which may have tires secured tread-to-tread in the form of a sloping grid or suspended individually by chains or some other means) are classified as climbing events with flexible components. Since these climbing events do not provide a steady means of support and, therefore, require more advanced balance abilities, special consideration and caution is warranted.

CFA **5.1.6.1-A** Free-standing climbing events with flexible components shall not be included in play areas designed for preschool-age children. Only climbing events with flexible components that are designed as an access/egress

component may be included in play areas designed for preschool-age children.

Rationale: Climbing events with flexible components are considered to be one of the more challenging climbing components. On free-standing climbing events with flexible components, young children may get stuck in a "no way out" situation because the ability to ascend a climbing structure may develop before the ability to descend the same structure. In addition, young children may not have developed the cognitive ability to reverse their actions yet. So young children may be able to get up to the top of the climber but then be unable to get back down safely. If the child gets scared or panicky, this "no way out" situation may contribute to a fall.

CPSC **5.1.6.1-C** No specific requirement by CPSC.

CFA/CPSC **5.1.6.2-B** Climbing events with flexible components shall not be the sole means of access to play equipment.

Rationale: Climbing events with flexible components are considered to be one of the more challenging climbing components. Providing a less challenging mode of access/egress such as a stairway or step ladder, will ensure that younger children use the climbing event with flexible components because they want to assume its challenge not because they are forced to use it.

CFA **5.1.6.3-A** The top climbing member of a climbing event with flexible components shall be no higher than 3 feet above the protective surfacing.

Rationale: Given the added challenge of a climbing event with flexible components, a lower maximum fall height is warranted since falls are common during the transitions from climbing an access/egress component to standing on the platform .

CPSC **5.1.6.3-C** No specific requirement by CPSC.

CFA **5.1.6.4-A** The top climbing member of a climbing event with flexible component used as an access/egress component shall be at or below the level of the platform it serves.

Rationale: This requirement is intended to facilitate the transition from climbing to standing. If the top member of a climbing event with flexible component used as an access/egress component is located above the platform it serves, children may have difficulty making this transition and will be at increased risk of falls.

CPSC **5.1.6.4-C** No specific requirement by CPSC.

CFA **5.1.6.5-A** The slope of a climbing event with flexible components shall not exceed 50 degrees.

Rationale: Limiting the slope of climbing events with flexible components is important for preschool-age children as a means reducing falls because they are so challenging. This slope is correlated to the allowable slopes for stairways and step ladders.

CPSC **5.1.6.5-C** No specific requirement by CPSC.

CFA/CPSC **5.1.6.6-B** All connections between ropes, cables, chains, or tires shall be securely fixed.

CFA/CPSC **5.1.6.7-B** All openings within climbing events with flexible components or formed between their components and other structural components shall conform to the entrapment criteria (see Section 4.7.4).

CFA/CPSC **5.1.6.8-B** The perimeter length of the openings in climbing nets (the sum of the length of all four sides) shall not be between 17 and 28 inches to preclude head entrapment.

Rationale: For climbing nets, special attention to entrapment hazards is warranted due to known patterns of injury and the potential for strangulation.

SAFETY ALERT: CPSC issued a warning about head entrapment hazards in climbing nets because such hazards can cause strangulation (see Appendix A). Openings must either be too small to permit entry of a child's body or large enough to permit free passage of a child's head.

CFA/CPSC **5.1.6.9-B** Climbing events with flexible components shall be securely fixed at both ends. When one end is connected to the ground, anchoring devices shall be below ground beneath the base of the protective surfacing material to prevent trip hazards.

5.1.7 SLIDING POLES

CFA/CPSC **5.1.7.1-B** Sliding poles shall not be included in play areas designed for preschool-age children.

Rationale: Vertical sliding poles are designed to be more challenging than other climbing components. In most cases, preschool-age children do not have the requisite upper body strength and coordination to safely use vertical poles. Further, once younger children grasp the pole and start their descent, they are forced to complete the event since there is no alternative. Play equipment designers should minimize potentially frightening situations in which young children may get stuck without an easy way down.

5.1.8 TURNING OR CHINNING BARS

CFA **5.1.8.1-A** Turning or chinning bars shall have a circular cross-section.

CPSC **5.1.8.1-C** No specific requirement by CPSC.

CFA **5.1.8.2-A** The diameter of turning or chinning bars shall conform to the general requirements for the diameter of hand-gripping components (see Section 5.2.3).

CPSC **5.1.8.2-C** No specific requirement by CPSC.

CFA **5.1.8.3-A** Turning or chinning bars shall be at least 3 feet but not more than 4 feet above the protective surfacing.

Rationale: This range of acceptable heights for turning bars is intended to ensure that the largest users will not hit their head when hanging from their knees while also ensuring that the smallest users will not have too much difficulty mounting the equipment. The distance from the largest user's head to knees was estimated by subtracting knee height from stature for a 95th percentile 5-year-old; this value is 31.5 inches.

CPSC **5.1.8.3-C** No specific requirement by CPSC.

5.1.9 PARALLEL BARS

CFA **5.1.7.1-A** Parallel bars designed as an upper body device shall not be included in play areas designed for preschool-age children.

Rationale: Preschool-age children do not have the requisite strength and coordination to safely negotiate parallel bars designed as an upper body device.

CPSC **5.1.7.1-C** No specific requirement by CPSC.

5.1.10 OVERHEAD HORIZONTAL LADDERS

Due to the high challenge level of overhead horizontal ladders, children younger than four years of age do not generally have the requisite upper body strength to negotiate this equipment safely. The following recommendations are, therefore, intended only to apply to the 4- and 5-year-olds in the preschool-age group.

CFA/CPSC **5.1.10.1-B** All spaces between rungs on overhead horizontal ladders shall conform to the entrapment criteria (see Section 4.7.4).

CFA/CPSC **5.1.10.2-B** Rungs on overhead horizontal ladders shall be parallel and evenly spaced when designed for preschool-age children.

CFA/CPSC **5.1.10.3-B** The distance between consecutive rungs on an overhead horizontal ladder shall not exceed 12 inches, center-to-center.

CFA/CPSC **5.1.10.4-B** The first handhold on either end of an overhead horizontal ladder shall not be placed directly above the platform or climbing rung used for mount or dismount.

CFA **5.1.10.5-A** The horizontal distance between the first handhold on an overhead horizontal ladder and its access/egress structure, at both ends of the horizontal ladder, shall be between 8 and 10 inches.

Rationale: This requirement is intended to facilitate mount and dismount of upper body equipment by ensuring that the first handhold at either end is reachable for the smallest user while also minimizing the risk of an impact incident if a child falls from the first handhold.

CPSC **5.1.10.5-C** No specific requirement by CPSC.

CFA/CPSC **5.1.10.6-B** The maximum height of handholds on overhead horizontal ladders shall not exceed 60 inches above the protective surfacing.

Rationale: A separate maximum height requirement is warranted for upper body equipment due to their design and mode of use. The 60-inch requirement corresponds to the vertical grip reach of the largest user plus an allowance for ground clearance. The vertical grip reach of a 95th percentile 5-year-old is 53.9 inches.

CFA **5.1.10.7-A** The maximum height of an access/egress structure serving an overhead horizontal ladder shall not exceed 18 inches above the protective surfacing.

Rationale: The distance between the top of the access/egress structure and the first handhold must accommodate the vertical grip reach of the smallest user without making the equipment difficult for the largest user to mount/dismount. The vertical grip reach of a 5th percentile 2-year-old is 39.1 inches.

CPSC **5.1.10.7-C** No specific requirement by CPSC.

CFA/CPSC **5.1.10.8-B** Overhead horizontal ladders shall be located so that children traversing the ladder cannot interfere with the play of children on adjacent play events, particularly with their descent on slides.

Rationale: The swinging movements of children generated on overhead horizontal ladders warrant special precautions to reduce the risk of impact with children on adjacent play events.

CFA/CPSC **5.1.10.9-B** The design of structures and play events adjacent to overhead horizontal ladders shall not facilitate climbing on its top support bars.

5.1.11 OVERHEAD RINGS

CFA **5.1.11.1-A** Overhead rings shall not be included in play areas designed for preschool-age children.

Rationale: Young children do not have the advanced perceptual skills necessary to safely negotiate upper body equipment on which the handholds are not stationary or equidistant.

CPSC **5.1.11.1-C** No specific requirement by CPSC.

5.1.12 TRACK RIDES

A track ride generally consists of a handle or bar that children hold on to and hang freely from in a vertical position while it slides along a cable or cross beam horizontally. There may be a platform on one or both ends of the track ride where children can get on and off.

CFA **5.1.12.1-A** Track rides shall not be included in public play areas, regardless of the age of intended users.

Rationale: Younger children typically do not have the requisite upper body strength for track rides, and older children often misuse this kind of equipment. Moreover, if poorly designed or not well maintained, track rides may achieve excessive speeds. At higher speeds, children are likely to have more difficulty making the transition when getting off the track ride -- increasing the risk of a fall or impact with a support structure, both of which can cause serious injury. Improper design or maintenance may also cause failure of the handhold device to traverse the entire length of the cable or cross beam. In this case, a child may be stranded in the middle of the track ride; the risk of fall injuries is then increased for many reasons, including the likelihood that another child, or adult, will try to help the stranded child down while balance and center of gravity are comprised by their awkward positions.

CPSC **5.1.12.1-C** No specific requirement by CPSC.

5.1.13 CLIMBING ROPES

CFA **5.1.13.1-A** Individual climbing ropes shall not be included in public play areas, regardless of the age of intended users.

Rationale: A free swinging rope presents a significant risk of injury caused by moving impact incidents, particularly because children have less control of a free swinging rope than they do of a swing. In addition, either a free swinging rope or a climbing rope originally anchored at both ends that

becomes unattached may be looped back on itself and form a noose. Braided or twisted ropes have also been known to fray or become loose and thus present entanglement and strangulation hazards.

CPSC **5.1.13.1-C** Individual vertically suspended climbing ropes shall be allowed only if they are securely anchored to a footing at the lower end to prevent the rope from being looped back on itself and forming a noose.

5.1.14 BRIDGES

Bridges are often included on composite play structures to connect two decks. Some are flat, while others are arched. In addition, some can be classified as flexible bridges because provide motion as children walk or run across.

CFA **5.1.14.1-A** Bridges shall not be any wider than the outer width of its support structure.

CPSC **5.1.14.1-C** No specific requirement by CPSC.

CFA **5.1.14.2-A** The two platforms from which a bridge is suspended shall have equal heights so that the bridge has the same elevation on each end.

CPSC **5.1.14.2-C** No specific requirement by CPSC.

CFA **5.1.14.3-A** Spaces between planks of a bridge as well as any openings between the first plank on either end and the platform shall not present pinch or crush hazards (see Section 4.7.3).

CPSC **5.1.14.3-C** No specific requirement by CPSC.

CFA **5.1.14.4-A** Spaces between planks of a bridge as well as any openings between the first plank on either end and the platform shall conform to all entrapment criteria (see Section 4.7.4).

CPSC **5.1.14.4-C** No specific requirement by CPSC.

CFA **5.1.14.5-A** Bridges shall conform to all criteria for elevated surfaces (see Section 5.3), including the requirements for guardrails or protective barriers.

CPSC **5.1.14.5-C** No specific requirement by CPSC.

5.1.15 BALANCE BEAMS

CFA/CPSC **5.1.15.1-B** Balance beams shall be no higher than 12 inches.

Rationale: This maximum height corresponds to the approximate crotch height of the smallest user, in this case taking the younger age group into account for added safety; the gluteal furrow height of a 5th percentile 2-year-old is 11.5 inches. Additional height is not necessary for play value.

CFA **5.1.15.2-A** Balance beams shall be located out of high traffic areas to avoid tripping hazards.

CPSC **5.1.15.2-C** No specific requirement by CPSC.

5.1.16 CHAIN OR CABLE WALKS

Chain or cable walks generally consist of a pair of chains or cables suspended in the same vertical plane, one low to the ground for children to stand and walk on and one up above for children to hold on to as a balancing activity. Often, two pairs are suspended near one another as a double chain or cable walk. There may be a platform at one or both ends, or the chains or cables may be suspended only from independent support posts.

CFA **5.1.16.1-A** Chain or cable walks shall not be included in public play areas, regardless of the age of intended users.

Rationale: Chain or cable walks present tripping hazards and a significant risk of falls and impact injuries. Double chain or cable walks present an even greater risk of serious impact injuries since a child who trips on the first chain or cable may fall and land on the second. Given the small diameter of the chains or cables, their motion, and because they are very slippery with any wetness, the high challenge level of this play event becomes hazardous for most children. Other play events can be included on playgrounds to provide safer, more appropriate balance activities and challenges.

In addition, if not well maintained, children may have access to a chain or cable attached only on one end which presents the risk of strangulation. Children may also attempt to use an unattached chain or cable as a free swinging rope, presenting a risk of moving impact injuries.

CPSC **5.1.16.1-C** No specific requirement by CPSC.

5.2 Hand-Gripping Components

Handrails and other handholds are essential in helping steady children as they negotiate climbing components, and thus add protection against falls and injuries.

5.2.1 HANDRAILS

CFA/CPSC	**5.2.1.1-B**	Continuous handrails shall be provided on both sides and along the entire length of all stairways and step ladders. Rung ladders do not require handrails since rungs or side supports provide hand support on these more steeply inclined climbing components. *Rationale: Handrails are a critical means of support that help children maintain balance while climbing up or down the access/egress component. The design of handrails shall be continuous so that children do not have to remove their hands while climbing.*
CFA	**5.2.1.2-A**	For spiral stairways, a continuous handrail shall be provided at least along the outer edge.
CPSC	**5.2.1.2-C**	No specific requirement by CPSC.
CFA/CPSC	**5.2.1.3-B**	Handrails shall be available for use at the appropriate height beginning with the first step.
CFA/CPSC	**5.2.1.4-B**	Handrail height, which is the vertical distance between the top front edge of a step (tread nosing) and the top surface of the handrail above it, shall be greater than 22 inches but less than 26 inches. *Rationale: The values required for handrail height are based on the approximate elbow height of the smallest and largest users; the elbow heights for a 5th percentile 2-year-old and a 95th percentile 5-year-old were estimated as the difference between suprasternale height and shoulder-to-elbow length. A range is allowed because children are likely to grasp handrails above elbow height and sometimes at or above shoulder height. Note that the shoulder height (suprasternale height) of the smallest user, a 5th percentile 2-year-old, is 26.1 inches, so that even handrail heights at the upper end of the range should be usable by all children in this age group.*

CFA/CPSC **5.2.1.5-B** Handrails shall extend high enough at the top of the access to provide support until a child fully achieves the desired posture on the platform.

CFA/CPSC **5.2.1.6-B** Any openings formed by handrails and structural components of the play equipment shall conform to the entrapment criteria (see Section 4.7.4).

CFA/CPSC **5.2.1.7-B** All handrails and other means of hand support shall be securely fixed and not turn or wobble when grasped.

5.2.2 OTHER HANDHOLDS

CFA/CPSC **5.2.2.1-B** Hand support shall be provided to facilitate a child's transition from climbing to standing for climbing components which serve as access/egress to platforms and other play events but that do not have traditional handrails. Options for other handholds include vertical handrails and loop handgrips, which may extend out over the top of the access.

CFA **5.2.2.2-A** Single, overhead horizontal bars are not recommended as an alternate means of hand support because they tend to encourage unintended, dangerous uses.

CPSC **5.2.2.2-C** No specific requirement by CPSC.

CFA/CPSC **5.2.2.3-B** Any openings formed by handholds and structural components of the play equipment shall conform to the entrapment criteria (see Section 4.7.4).

5.2.3 DIAMETER OF HAND-GRIPPING COMPONENTS

CFA/CPSC **5.2.3.1-B** Handrails, handholds, rungs and other components intended to be grasped by the hands shall have a diameter or maximum cross-sectional dimension between 0.95 and 1.55 inches. To benefit the weakest children, a diameter of 1.25 inches for hand-gripping components is preferred.

Rationale: Requirements for the diameter of hand-gripping components are related to grip strength and hand size. Grip strength for the minimum user peaks at a diameter of about 1.25 inches, which also allows at least three-quarters of the smallest user's hand to enclose the component.

IU5.3 Platforms and Other Elevated Play Surfaces

5.3.1 GENERAL REQUIREMENTS

CFA/CPSC	**5.3.1.1-B**	Platforms shall be within ± 2 degrees of a horizontal plane.
CFA/CPSC	**5.3.1.2-B**	All transitional play surfaces, such as platforms, landings, walkways, and ramps, shall allow for proper drainage and prevent the accumulation of debris. Drainage holes shall preclude finger entrapment and pinching.
CFA	**5.3.1.3-A**	Structures with roofs shall be designed to minimize the likelihood of children climbing on top of them.
CPSC	**5.3.1.3-C**	No specific requirement by CPSC.

5.3.2 GUARDRAILS AND PROTECTIVE BARRIERS

Guardrails and protective barriers are an essential means of preventing injuries due to falls. Both guardrails and protective barriers are intended to prevent inadvertent falls off elevated play surfaces. Protective barriers, however, provide a greater degree of protection: in addition to preventing inadvertent falls over the edge, protective barriers are designed to prevent intentional attempts by children seeking to defeat the barrier.

5.3.2.1 General Requirements to Protect Against Falls from Elevated Surfaces

CFA/CPSC	**5.3.2.1.1-B**	Guardrails or protective barriers shall be provided on all elevated surfaces, such as platforms, walkways, landings, ramps, and other transitional play surfaces, in accordance with the following requirements. An elevated surface is exempt from these requirements if a guardrail or protective barrier would interfere with the intended use of the equipment; this includes most climbing components and platforms that are layered so that the fall height does not exceed 20 inches. • Any elevated surface that is more than 20 inches above the protective surface shall have either a guardrail or protective barrier. • Guardrails are acceptable for elevated surfaces over 20 inches but not over 30 inches high; full protective barriers, however, are still preferable for this age group given their increased risk of falls.

- Any elevated surface that is more than 30 inches above the protective surface shall have a full protective barrier.

Rationale: The degree of protection required depends on the height of the elevated surface in combination with the age of the intended users. For preschool-age children, a greater degree of protection is warranted at lower elevations due to their less developed sense of balance and coordination, which increases their risk of falls.

CFA/CPSC **5.3.2.1.2-B** All guardrails and protective barriers shall completely surround the elevated surface, except for the entrance and exit openings necessary for a play event.

CFA **5.3.2.1.3-A** All guardrails and protective barriers shall provide stationary, non-flexible protection against falls.

CPSC **5.3.2.1.3-C** No specific requirement by CPSC.

CFA/CPSC **5.3.2.1.4-B** All guardrails and protective barriers shall be designed to facilitate supervision.

CFA/CPSC **5.3.2.1.5-B** All guardrails and protective barriers shall minimize the likelihood of children climbing on or over them.

CFA/CPSC **5.3.2.1.6-B** Infill may be used to minimize the likelihood of climbing. However, horizontal cross-pieces shall not be used as infill below the top rail because they can children a foothold for climbing. Vertical infill is preferable with regard to its lack of climbability and also because it can be grasped at any height for use as handholds. When solid infill is used, it is recommended that there be some transparent areas to facilitate supervision and to permit viewing of the platform.

5.3.2.2 Requirements for Guardrails

CFA/CPSC **5.3.2.2.1-B** The top surface of guardrails shall be at least 29 inches high and the lower edge of the guardrail shall not be more than 23 inches above the elevated surface.

Rationale: The minimum height of guardrails ensures that the standing center of gravity of the largest user is below the top edge, and thus

provides protection against inadvertent falls over the guardrail. The standing center of gravity for a 95th percentile 5-year-old is 26.9 inches.

The maximum distance between the lower edge of the guardrail and the elevated surface ensures that the smallest user cannot inadvertently walk under the guardrail. This measurement corresponds to the chest height at axilla for a 5th percentile 2-year-old, which is 23.6 inches.

CFA/CPSC **5.3.2.2.2-B** Guardrails may have openings greater than 9 inches, but shall not have any openings between 3.5 and 9 inches to conform with entrapment criteria (see Section 4.7.4).

Rationale: Because guardrails are not intended to prevent intentional attempts to climb under or through them, they may have openings greater than 9 inches which would allow a child to pass through without being at risk of entrapment.

5.3.2.3 Requirements for Protective Barriers

CFA/CPSC **5.3.2.3.1-B** The top surface of protective barriers shall be at least 29 inches high.

Rationale: The minimum height of protective barriers ensures that the standing center of gravity of the largest user is below the top edge, and thus provides protection against inadvertent falls over the guardrail. The standing center of gravity for a 95th percentile 5-year-old is 26.9 inches.

CFA/CPSC **5.3.2.3.2-B** Protective barriers shall not have any openings greater than or equal to 3.5 inches within the barrier (i.e., between uprights) or between the lower edge of the barrier and the elevated surface to conform with entrapment criteria (see Section 4.7.4).

Rationale: Because protective barriers are designed to prevent children from climbing under or through them, all openings must be less than 3.5 inches so that children are not at risk of entrapment.

5.3.3 STEPPED PLATFORMS

On some composite structures, platforms may be layered or tiered so that falls from a higher platform are terminated by a lower platform rather than the ground surface. Stepped platforms are a good easy means of access/egress for younger children.

CFA/CPSC **5.3.3.1-B** The difference in height between stepped platforms shall not exceed 12 inches, unless an alternate means of access/egress is provided between the platforms.

Rationale: Because children typically climb up stepped platforms rather than step up, the vertical rise between stepped platforms may be somewhat greater than the smallest user's step height. The step height of a 5th percentile 2-year-old is 8.7 inches.

CFA/CPSC **5.3.3.2-B** All openings between stepped platforms shall conform to the entrapment criteria (see Section 4.7.4).

CFA/CPSC **5.3.3.3-B** When the height of the lower of two consecutive stepped platforms is greater than 30 inches above the protective surfacing, protective infill shall be provided in the space between the stepped platforms so that there are no openings greater than 3.5 inches.

Rationale: Because elevated surfaces above 30 inches in height require protective barriers, the space between stepped platforms should not allow children to pass through them, preventing falls as well as intentional jumps. To conform to entrapment criteria, this space, therefore, must not present any openings greater than 3.5 inches.

5.4 Slides

Slides may be straight, wavy, curved, or spiral and may provide either open bedways or tubes for descent. Although some free-standing slides are still available, most slides are attached to composite structures. Because there is a high risk of falls at the top of slides and their accompanying access structures, designs which incorporate large platforms with multiple means of access/egress and adequate handholds for transitions contribute to the safer use of slides. Alternatively, slide chutes can be built onto the grade of a natural or man-made slope; these are called embankment or hill slides.

Children can be expected to descend slides in many ways -- not just sitting, facing forward. Some will slide down backwards, on their knees, or lying on their back. Others will walk up and down the slide chute. Preschool-age children, the most frequent users of slides, often slide down on their stomachs, either head or feet first. These alternate sliding behaviors increase children's risk of injury.

Providing multiple means of access/egress to and from slides is especially important for preschool-age children since many climb up to the top of a slide and are then hesitant to go down the chute and, therefore, need an alternate, easy way to climb back down.

5.4.1 ACCESS TO SLIDES AND SLIDE PLATFORMS

CFA/CPSC **5.4.1.1-B** Climbing components and platforms which provide access to slides shall follow the general requirements in Section 5.1 and Section 5.3.1.

CFA/CPSC **5.4.1.2-B** Slide platforms shall be protected by guardrails or protective barriers in accordance with the requirements for elevated surfaces in Section 5.3.2.

CFA/CPSC **5.4.1.3-B** Slide platforms shall be at least 22 inches long.

Rationale: Platforms at the top of slides shall be long enough to accommodate children as they make the transition from a standing to a sliding position. The length of slide platforms corresponds to the buttock-to-knee measurement for a 95th percentile 12-year-old. The added protection of using an anthropometric value based on school-age children is warranted given the increased risk of falls for younger children.

CFA/CPSC **5.4.1.4-B** Slide platforms shall be at least as wide as the slide chute.

5.4.2 SLIDE CHUTE ENTRANCE

CFA/CPSC **5.4.2.1-B** Slide chutes shall be designed and constructed so that there are no gaps or spaces between the platform and the start of the sliding surface or any other openings, holes, protrusions or equipment components at the top of the slide or on the platform that may be catch points and cause entanglement incidents.

> *SAFETY ALERT: CPSC issued a warning about entanglement hazards (see Appendix A). Jackets and sweatshirts with hoods and/or drawstrings, ponchos, attached mittens, and scarves have been implicated in playground-related entanglement incidents that, in several cases, resulted in death by strangulation. Jewelry, such as necklaces and rings, has also been implicated in injuries from entanglement.*

CFA/CPSC **5.4.2.2-B** The design and construction of the slide chute entrance shall channel the user into a seated position for sliding. This may be accomplished with a hood, guardrail, or other device; such means shall not encourage climbing or other dangerous uses.

CFA **5.4.2.3-A** A single horizontal bar or chain in front of the slide chute entrance is not recommended as a means to channel users into a seated position because children use such components in many hazardous ways.

CPSC **5.4.2.3-C** No specific requirement by CPSC.

CFA/CPSC **5.4.2.4-B** Handholds or some other means of hand support shall be provided at the entrance to all slide chutes (except on tubes slides) to facilitate the transition from a standing to a sitting position for sliding and to decrease the risk of falls.

CFA/CPSC **5.4.2.5-B** The handholds or other means of hand support shall extend high enough to provide hand support for the largest child in a standing position and low enough to provide hand support for the smallest child in a sitting position.

CFA **5.4.2.6-A** The handholds or other means of hand support may be an integral part of the design feature which channels the user into a seated position.

CPSC **5.4.2.6-C** No specific requirement by CPSC.

CFA **5.4.2.7-A** The fall height of slides -- which is the height of the slide chute entrance -- shall not exceed 4 feet above the protective surfacing for preschool-age children, regardless of the type of slide.

Rationale: Limiting the fall height of slides is essential given the great risk of falls and related potential for serious injuries. Slides are involved in almost half of all injuries sustained by preschool-age children and extra precaution is, therefore, warranted.

CPSC **5.4.2.7-C** No specific requirement by CPSC.

5.4.3 SLIDING SURFACE

CFA/CPSC **5.4.3.1-B** The average incline of the slide chute shall be no more than 30 degrees. This can be measured by determining that the height to length ratio does not exceed 0.577 (see Figure 5-2). No span on the sliding surface shall have a slope greater than 50 degrees.

The height of the slide shall be taken as the vertical distance between the slide chute entrance and exit. The length of the slide shall be taken as the horizontal distance between the slide chute entrance and exit.

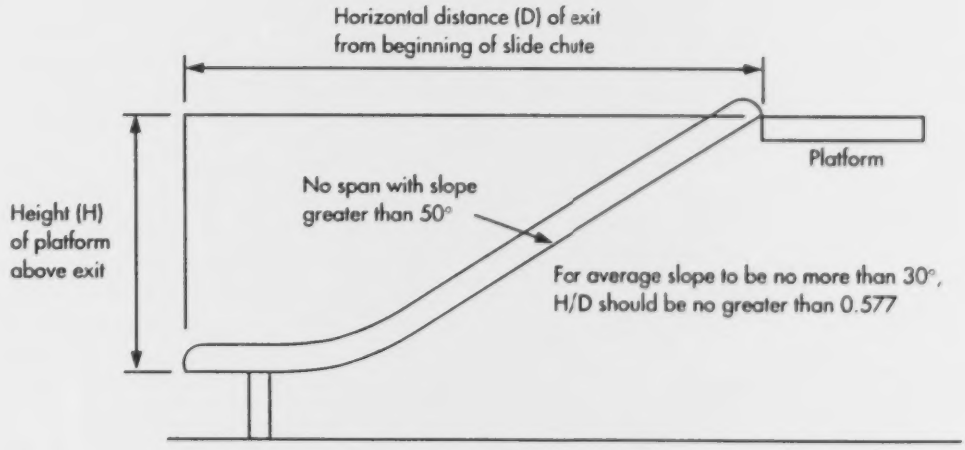

Horizontal distance (D) of exit
from beginning of slide chute
Platform
No span with slope
greater than 50°
Height (H)
of platform
above exit
For average slope to be no more than 30°,
H/D should be no greater than 0.577

Figure 5-2: Slide Slope[31]

[31] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA/CPSC **5.4.3.2-B** Any change in the slope of the sliding surface (e.g., wave slides) shall not allow a child to lose contact with the sliding surface.

CFA **5.4.3.3-A** The sliding surface shall have an inside width of at least 12 inches.

Rationale: The slide surface width is intended to accommodate the largest user, either in a seated position or lying down since both are anticipated uses. The hip breadth and shoulder breadth of a 95th percentile 5-year-old are 9.1 inches and 11.5 inches, respectively.

CPSC **5.4.3.3-C** No specific requirement by CPSC.

CFA/CPSC **5.4.3.4-B** Slides with flat open chutes shall have sides at least 4 inches high extending along both sides for the entire length of the sliding surface. The sides shall be an integral part of the chute, without any gaps between the sides and the sliding surface (with the exception of roller slides).

CFA/CPSC **5.4.3.5-B** Slides may have an open chute with a circular, semi-circular, or curved cross-section provided that either the vertical height of the sides is at least 4 inches when measured at right angles to a horizontal line that is 12 inches wide inside the chute (see Figure 5-3) or the vertical height of the sides is no less than 4 inches minus two times the width of the slide chute divided by the radius of the slide chute curvature (see Figure 5-4).

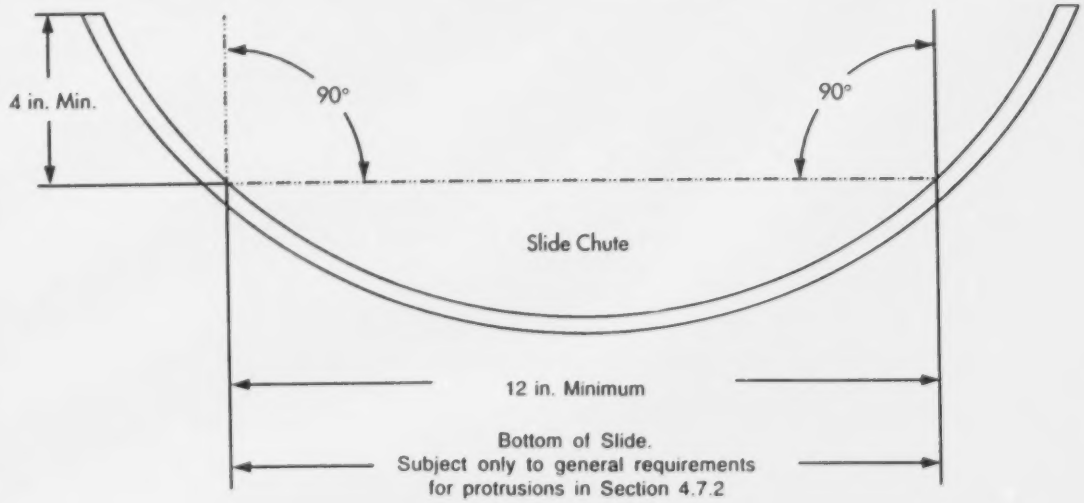


Figure 5-3: Minimum Side Height for Slides with Circular Cross-Section[32]

[32] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

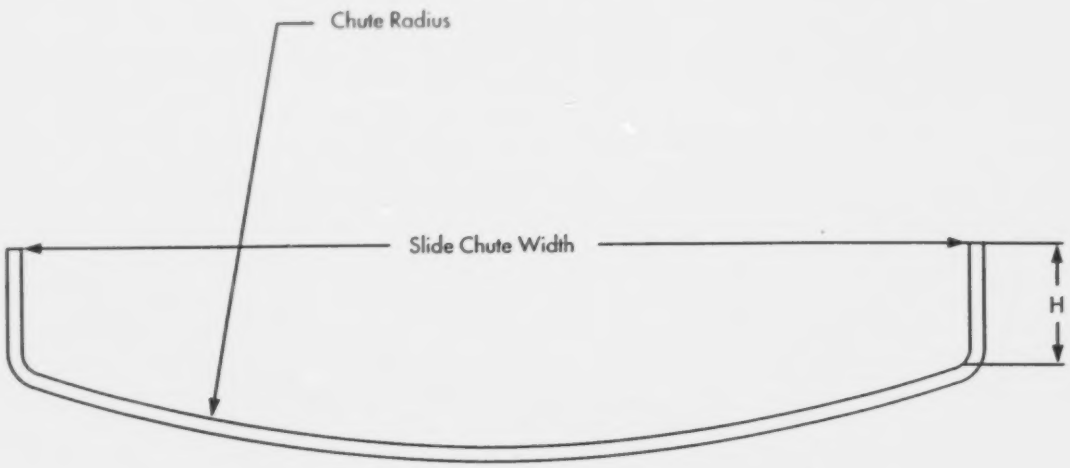


Figure 5-4: Formula for Minimum Vertical Side Height for Slides with Curved Chute[33]

CFA	**5.4.3.6-A**	The sliding section shall not have any seams or joints which could cause entanglement incidents or in which hazardous debris may collect.
CPSC	**5.4.3.6-C**	No specific requirement by CPSC.
CFA/CPSC	**5.4.3.7-B**	Metal slides shall be located in shaded areas to prevent burns caused by direct sun on the slide chute (see Section 4.4.2.2).

SAFETY ALERT: CPSC issued a warning (see Appendix A) about metal equipment because of incidents in which children suffered second and third degree burns to their hands, legs, and buttocks when they sat on metal stairs, decks, or slides. Younger children are at most risk because, unlike older children who react quickly by pulling away their hands or getting off a hot surface, very young children may remain in place when they contact a hot surface.

[33] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA/CPSC **5.4.3.8-B** For tube slides:

Tube slides shall meet applicable requirements for other slides.

The minimum internal diameter of the tube shall be at least 23 inches.

Rationale: This minimum diameter is required to ensure that all intended users can slide through the tube unimpeded.

Either barriers shall be provided or surfaces shall be textured to prevent children from sliding on top (outside) of the tube.

It should be noted that children using tube slides may not be visible to a supervisor. Consideration should be given to having extra supervision on playgrounds with tube slides or to having transparent tube sections for visibility of children inside the slide.

CFA/CPSC **5.4.3.9-B** For roller slides:

Roller slides shall meet applicable requirements for other slides.

The space between adjacent rollers and between the ends of the rollers and the stationary structure shall be less than 3/16 inch.

Frequent inspections and maintenance are required to ensure that there are no broken or missing rollers.

CFA/CPSC **5.4.3.10-B** For embankment slides:

Embankment slides shall meet applicable requirements for other slides.

The slide chute of an embankment slide shall have a maximum height of 12 inches above the underlying ground surface. Such design basically eliminates the hazards of falls from height.

It is important that some means be provided at the slide chute entrance of embankment slides to minimize the likelihood that they will be used by children on skates, skateboards, or bicycles.

CFA/CPSC **5.4.3.11-B** For curved and spiral slides:

All applicable requirements for straight slides shall be adhered to, with special attention given to design features of curved or spiral slides which may present unique problems such as lateral discharge of the user.

For preschool-age children, only short spiral slides, one turn (360 degrees) or less, are recommended.

Rationale: Curved and spiral slides offer a more complex motion than straight slides. Extra attention to this problem is warranted for preschool-age children because they have less ability to maintain balance and postural control than older children.

5.4.4 EXIT REGION

CFA/CPSC **5.4.4.1-B** The design of all slides shall incorporate an exit region as specified below.

Rationale: The exit region helps children maintain balance and facilitates a smooth transition from a sitting, sliding position to a standing, exiting position, thereby reducing the likelihood of falls and injuries at the lower end of slides.

CFA/CPSC **5.4.4.2-B** The exit region shall be essentially horizontal and parallel to the ground.

CFA/CPSC **5.4.4.3-B** The exit region shall be at least 11 inches long.

Rationale: The length of the exit region is correlated to the thigh length of the largest user. This dimension, which is the distance between tibial and trochanter, for a 95th percentile 5-year-old is 11 inches.

CFA **5.4.4.4-A** The exit region shall be no more than 11 inches above the protective surfacing.

Rationale: The maximum height of the exit region is correlated to the distance between the back of the knee and heel for the largest user. The tibiale height, which is used to estimate this distance, is approximately 11 inches for a 95th percentile 5-year-old.

Note: The CFA requirement for the height of the exit region is based on anthropometric data and is , therefore, different for preschool-age and school-age children. The CPSC requirement for the height of the exit region is correlated to the height of the slide rather than the age of intended users.

CPSC **5.4.4.4-C** For slides that are no more than 4 feet in height, the height of the exit region shall be no more than 11 inches from the protective surface.

CFA	**5.4.4.5-A**	The radius of curvature of the sliding surface in the exit region shall be at least 30 inches.
CPSC	**5.4.4.5-C**	No specific requirement by CPSC.
CFA/CPSC	**5.4.4.6-B**	Slide exit edges shall be rounded or curved in accordance with Section 4.7.1.
CFA/CPSC	**5.4.4.7-B**	Slide exits shall be located in uncongested sections of the play area.

5.5 Swings

Swings can be classified as either single or multiple axis swings. A single axis swing is intended to swing back and forth in a single plane and generally consists of a seat supported by at least two suspending members each of which is connected to separate pivot on an overhead support structure. To-fro swings, with either conventional belt-type or infant seats, are single axis swings. A multiple axis swing consists of a seat -- usually a tire suspended in a horizontal orientation -- supported by three suspending members each of which is connected to the same pivot on an overhead support structure allowing it to rotate and swing in any direction.

Children of all ages enjoy the sensations created by swinging. The intended use is for children to sit on swings, but younger children often swing on their stomachs and older children often swing kneeling or standing up. Older children may also jump off while swinging. Another unintended use of swings is that children twist the suspending members up, then let them unwind to spin around. All of these alternative uses increase the risk of injury.

5.5.1 GENERAL REQUIREMENTS

CFA/CPSC **5.5.1.1-B** The following types of swings shall not be included in public play areas, regardless of the age of intended users.

- Animal Swings
- Multiple Occupancy Swings such as Gliders (except Tire Swings)
- Swinging Exercise Rings and Trapeze Bars
- Rope Swings

Rationale: Animal swings are generally constructed of cast aluminum or molded plastic and painted to look like horses, zebras, ducks, other animals, rockets, cars, or other figures. They typically weigh between 30 and 80 pounds. Do not confuse animal swings with animal spring rockers, because the latter is not necessarily hazardous. Animal swings are hazardous because their weight and the likelihood of moving impact incidents.

SAFETY ALERT: CPSC issued a notice calling for the removal of all animal swings (see Appendix A). As of January 1995, two children had been killed by these swings and 42 children had suffered head injuries after being struck by them. The injuries included skull fractures, concussion and brain damage, serious lacerations and contusions, and one child who lost sight in one eye.

Multiple occupancy swings such as gliders generally consist of one or two benches that allow two or more children to sit and swing together. This kind of swing is more common on backyard-type than public play

equipment. Multiple occupancy swings such as gliders are hazardous because they are typically constructed of heavy, hard-hitting, rigid materials and, therefore, may cause serious head injuries in the event of an impact incident.

Swinging exercise rings are typically a pair of rings about 6-7 inches in diameter each hanging on a chain from an overhead beam so that they can swing freely. A trapeze bar is typically a metal bar about 2 feet in length suspended from each end by a chain that it can swing freely. These are intended more for gymnastics and fitness activities, although they are still found on some older swing structures on playgrounds. Swinging exercise rings or trapeze bars are hazardous because they are typically constructed of heavy, hard-hitting, rigid materials and, therefore, may cause serious head injuries in the event of an impact incident. Note: this specification does not apply to overhead hanging rings such as those on a ring trek or ring ladder; there is a maximum chain length of 12 inches for this kind of overhead rings (see Section 6.1.11.3).

Rope swings generally consist of a long, thick rope suspended vertically from an overhead beam. Sometimes there are large knots tied in the rope to provide foot and hand holds. Alternatively, they may be a small round seat mounted on the rope. A free swinging rope presents a significant risk of injury caused by moving impact incidents, particularly because children have less control of a free swinging rope than they do of a conventional swing. In addition, a free swinging may be looped back on itself and form a noose. Braided or twisted ropes have also been known to fray or become loose and thus present entanglement and strangulation hazards.

5.5.2 SINGLE-AXIS SWINGS

5.5.2.1 Swing Seats

CFA/CPSC **5.5.2.1.1-B** Swing seats shall not be constructed of wood, metal, or other hard, heavy, rigid materials.

Rationale: Using lightweight, impact-absorbing materials for swing seats helps reduce the severity of injuries if impact incidents occur. Heavy, rigid swing seats may cause serious impact injuries.

CFA/CPSC **5.5.2.1.2-B** All swing seats shall be made of lightweight materials such as rubber or plastic.

CFA **5.5.2.1.3-A** For strength, durability, and safety, flexible strap-type seats constructed either of molded rubber with a steel insert or high-density polyethylene are recommended.

CPSC **5.5.2.1.3-C** No specific requirement by CPSC.

CFA/CPSC **5.5.2.1.4-B** The edges of all swing seats shall be smoothly finished or have rounded edges and shall conform the requirements for protrusions on suspended members of swing assemblies described in Section 4.7.2.8.

CFA/CPSC **5.5.2.1.5-B** All seats for single-axis swings shall be designed to accommodate only one user at a time.

CFA **5.5.2.1.6-A** The seat height measured from the underside of an occupied conventional swing shall be no less than 12 inches and no more than 18 inches above the protective surfacing (see Figure 5-5). NOTE: If loose-fill material is used as a protective surfacing, the seat height should be determined after the material has been leveled.

Rationale: Swings should be suspended at a height which allows the smallest children to seat themselves relatively easily without being so low that the largest children's feet will consistently hit the ground while swinging. This range is intended to accommodate the approximate seated height of a 95th percentile 5-year-old (tibiale height, which is the distance from the heel to the back of the knee, is 11.4 inches) and the buttock height of a 5th percentile 4-year-old (gluteal furrow height is 14.6 inches) who is assumed to be the smallest likely users of this type of swing. Note that the buttock height of a 50th percentile 3-year-old is 15.1, so that most three-year-olds are also accommodated by this specification.

CPSC **5.5.2.1.6-C** The seat height measured from the underside of an occupied conventional swing shall be no less than 12 inches above the protective surfacing. NOTE: If loose-fill material is used as a protective surfacing, the seat height should be determined after the material has been leveled.

5.5.2.2 Infant/Tot Seats

Infant/tot swings are seats designed for use by children under the age of four with adult assistance.

CFA/CPSC **5.5.2.2.1-B** The seats and suspension systems of infant/tot swings shall conform to all of the requirements for other single-axis swings specified in Section 5.5.2, except 5.5.2.1.6.

CFA/CPSC **5.5.2.2.2-B** The seats and suspension systems of infant/tot swings shall conform to all entrapment criteria (see Section 4.7.4) without presenting any strangulation hazards.

CFA/CPSC **5.5.2.2.3-B** Infant/tot seats shall provide support on all sides of the child.

CFA/CPSC **5.5.2.2.4-B** Bucket-style, fully-enclosed infant/tot are recommended.

Rationale: Bucket-style, fully-enclosed infant/tot seats are one design which effectively provides equal support on all sides of the child, thus helping to minimize tipping.

CFA **5.5.2.2.5-A** Chair-style contour infant/tot seats are not recommended.

Rationale: Chair-style contour infant/tot seats are not recommended because they do not provide equal support on all sides of the child and, therefore, are likely to tip. In addition, children often fall out or can climb out of this type of seat. Many of the chair seats also present entrapment hazards.

CPSC **5.5.2.2.5-C** No specific requirement by CPSC.

CFA **5.5.2.2.6-A** Infant/tot seats designed to provide proper support in only one orientation shall preclude the possibility of an adult seating the child in other, unintended orientations.

Rationale: There should not be any openings in infant/tot seats that could be confused as leg cut-outs and, consequently, lead to improper, hazardous orientations. If children are positioned in an infant/tot seats incorrectly , the swing will be more likely to tip.

CPSC **5.5.2.2.6-C** No specific requirement by CPSC.

CFA/CPSC **5.5.2.2.7-B** The height of an occupied infant/tot seat, measured from the underside of the seat to the protective surfacing, shall be no less than 24 inches (see Figure 5-5).

Rationale: A height of 24 inches or more will minimize the likelihood that infant/tot seats be used by unsupervised young children who may become stuck in the seat.

CFA/CPSC **5.5.2.2.8-B** Infant/tot seats shall not be suspended in the same bay as other swings.

Rationale: Infant/tot seats are designed for use by children under four years of age with adult assistance. Because older children using swings often lack control, especially when getting on and off, separating them helps reduce the likelihood of impact incidents between infant/tot seats and regular seats.

5.5.2.3 Swing Support Structures

CFA/CPSC **5.5.2.3.1-B** Single-axis swings shall not be attached to composite structures.

Rationale: Given the risk of life-threatening head injuries if a moving impact incident occurs, it is important that swings be installed only on independent structures and located away from all other equipment. Moreover, composite play structures tend to attract crowds of children playing at a fast pace, which reduces their attention level to peripheral stimuli thus increasing the risk of a moving impact incident.

CFA/CPSC **5.5.2.3.2-B** Swing support structures shall be designed to minimize the likelihood of children climbing on them. Support structures shall, therefore, not use horizontal cross-bars, other than the top cross-beam from which the swings are suspended.

CFA/CPSC **5.5.2.3.3-B** Swing hangers for single-axis swings shall spaced no less than 20 inches apart (see Figure 5-5).

Rationale: Hanging swings in this manner helps reduce side-to-side movement and, therefore, the potential for impact incidents.

CFA **5.5.2.3.4-A** All swing hangers shall be commercial grade and designed to reduce wear.

CPSC **5.5.2.3.4-C** No specific requirement by CPSC.

CFA/CPSC **5.5.2.3.5-B** Swing hangers shall be designed to prevent any pinch, crush, or shearing hazards.

CFA/CPSC **5.5.2.3.6-B** Connecting links such as "S" hooks, "C" hooks, or "Pelican" hooks shall be pinched closed as tightly as possible and shall not present any entanglement hazards. A hook is considered closed if there is no gap or space greater than 0.04 inches. It is appropriate to measure the gap with a feeler gauge but, in the absence of such a gauge, the gap should not admit a dime.

CFA/CPSC **5.5.2.3.7-B** Fiber ropes shall not be used to suspend swings.

CFA/CPSC **5.5.2.3.8-B** The following clearances shall be provided up to a height of 60 inches above the protective surfacing for single-axis swings and swing structures (see Figure 5-5):

- The horizontal distance between adjacent swings shall be at least 24 inches.
- The horizontal distance between a seat and an adjacent structural component shall be at least 30 inches.

Rationale: The 24-inch minimum clearance required between adjacent swings accommodates the shoulder breadth of a 95th percentile 12-year-old (16 inches) with some tolerance on each side; at the same time this distance is not so large as to encourage children to run between swings.

The minimum clearance required between a swing and an adjacent structural component is greater to provide extra protection against injuries caused by impact with a rigid structure.

These minimum clearances shall be satisfied up to a height of 60 inches to accommodate the stature of a 95th percentile 12-year-old, since older children are likely to stand on swings.

The above dimensions are based on anthropometrics of older children but are appropriate for preschool-age children as well since younger children will benefit from proportionally larger clearances given their less developed cognitive and motor skills and their increased risk of injuries caused by impact with moving swings.

CFA/CPSC **5.5.2.3.9-B** For preschool-age children, the fall height of single-axis swings for -- which is the height of the pivot point -- shall not exceed 8 feet above the protective surfacing for either conventional seats or infant seats.

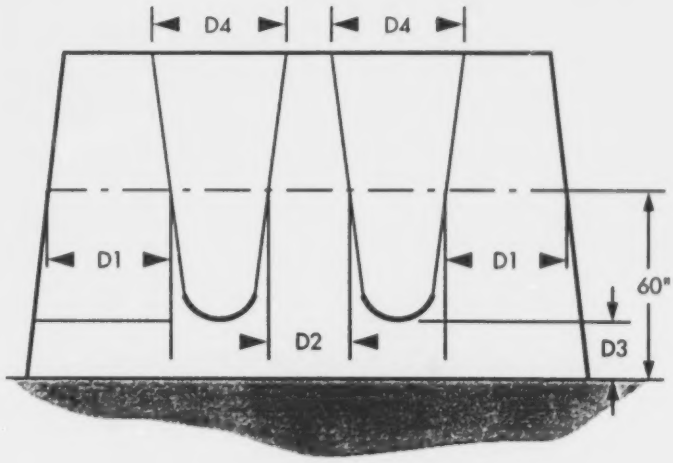
CFA/CPSC **5.5.2.3.10-B** No more than two single-axis swing seats shall be suspended within each bay of a swing support structure.

Rationale: Limiting the swing structures to two seats per bay helps reduce the likelihood of children getting hit by a moving swing. When there are more than two swings per bay, children swinging on a middle swing(s) is at increased risk of a collision from one or both sides. In addition, children do not always swing straight, and their play patterns often cause the swings to move out of the usual to-fro axis (e.g., twisting the swing then letting it unwind, jumping off without stopping the swing's motion).

CFA/CPSC **5.5.2.3.11-B** Swing structures shall be located away from other equipment and activities.

Greater protection against impact injuries can be provided by means of a low barrier at the edge of the buffer zone, such as a fence or hedge, to separate swings from other equipment. Such barriers, however, must not be an obstacle in the fall zone or hamper supervision by blocking visibility.

Rationale: Locating swings away from other equipment and activities, preferably in a corner of the play area, is an essential means of preventing impact injuries caused by children inadvertently running into the path of a moving swing.



D1 = 30" minimum

D2 = 24" minimum

D3 = 12" minimum and 18" maximum for regular swing seats
24" minimum for infant/tot swing seats

D4 = 20" minimum

Figure 5-5: Minimum Clearances for Single-Axis Swings[34]

[34] This Figure is an adaptation of a Figure in the CPSC *Handbook for Public Playground Safety*.

5.5.3 MULTI-AXIS SWINGS

5.5.3.1 Tire Swings

CFA/CPSC	**5.5.3.1.1-B**	Heavy truck tires shall be avoided to minimize the hazard of impact. If steel-belted radials are used, they shall be examined closely to ensure that there are no exposed steel belts which could cause laceration or puncture injuries. Plastic materials can be used as an alternative to simulate actual tires.
CFA/CPSC	**5.5.3.1.2-B**	Tires shall allow for proper drainage. Drainage holes shall preclude finger entrapment and pinching.
CFA	**5.5.3.1.3-A**	The lower edge of the tire shall be at least 12 inches but not more than 18 inches above the protective surfacing.
CPSC	**5.5.2.1.3-C**	No specific requirement by CPSC.

5.5.3.2 Tire Swing Support Structures

CFA/CPSC	**5.5.3.2.1-B**	Tire swings shall not be attached to composite structures. *Rationale: Given the risk of life-threatening head injuries if a moving impact incident occurs, it is important to locate swings away from all other equipment. Moreover, composite play structures tend to attract crowds of children playing at a fast pace, which reduces their attention level to peripheral stimuli thus increasing the risk of a moving impact incident.*
CFA/CPSC	**5.5.3.2.2-B**	Tire swing support structures shall be designed to minimize the likelihood of children climbing on them. Support structures shall, therefore, not use horizontal cross-bars, other than the top cross-beam from which the swings are suspended.
CFA	**5.5.3.2.3-A**	Tire swivels, shall be commercial grade and designed to reduce wear.
CPSC	**5.5.2.2.3-C**	No specific requirement by CPSC.
CFA/CPSC	**5.5.3.2.4-B**	Tire swivels shall be designed to prevent any pinch, crush, or shearing hazards.

CFA/CPSC **5.5.3.2.5-B** Connecting links such as "S" hooks, "C" hooks, or "Pelican" hooks shall be pinched closed as tightly as possible and shall not present any entanglement hazards. A hook is considered closed if there is no gap or space greater than 0.04 inches. It is appropriate to measure the gap with a feeler gauge but, in the absence of such a gauge, the gap should not admit a dime.

CFA/CPSC **5.5.2.3.6-B** Fiber ropes shall not be used to suspend swings.

CFA/CPSC **5.5.3.2.7-B** When the tire is held in a position closest to the support structure, the horizontal distance between the seat surface of the tire and the adjacent upright of the support structure shall be at least 30 inches (see Figure 5-6).

Rationale: This clearance is required to provide adequate space for children to reach out with their arms and legs or to lean back while sitting on the tire without impacting support structures.

CFA **5.5.3.2.8-A** The fall height of tire swings -- which is the height of the pivot point -- shall not exceed 8 feet above the protective surfacing.

CPSC **5.5.2.2.8-C** No specific requirement by CPSC.

CFA/CPSC **5.5.3.2.9-B** A multi-axis tire swing shall not be suspended from a structure having any other swings in the same bay.

CFA **5.5.3.2.10-A** Only one tire swing shall be suspended within a single bay.

CPSC **5.5.3.2.10-C** No specific requirement by CPSC.

CFA/CPSC **5.5.3.2.11-B** Swing structures shall be located away from other equipment and activities.

Greater protection against impact injuries can be provided by means of a low barrier at the edge of the buffer zone, such as a fence or hedge, to separate swings from other equipment. Such barriers, however, must not be an obstacle in the fall zone or hamper supervision by blocking visibility.

Rationale: Locating swings away from other equipment and activities, preferably in a corner of the play area, is an essential means of preventing impact injuries caused by children inadvertently running into the path of a moving swing.

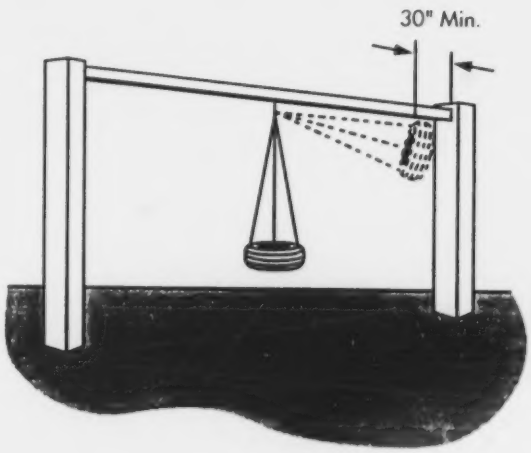


Figure 5-6: Minimum Clearance for Tire Swings[35]

[35] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

5.6 Rotating Equipment

5.6.1 SWINGING GATES

A rotating/swinging gate is a gate mounted on a single post that swings around the post, generally with a complete 360 degree rotation. Often the gate is a simple frame with vertical rails. Children stand on the gate as it rotates, as an alternative to more traditional merry-go-rounds.

CFA **5.6.1.1-A** Swinging, rotating gates shall not be included in public play areas, regardless of the age of intended users.

Rationale: Rotating/swinging gates present a high risk of fall and impact injuries. Younger children do not attend as well to peripheral stimuli or understand fully cause and effect, both of which increase the likelihood of moving impact incidents. Older children are likely to misuse this kind of rotating equipment, with an emphasis on making the gate rotate as fast as possible. Because these gates typically do not have any means to limit their speed, it is easy to create a hazardous situation with the rigid, heavy gate. In addition, the rotation and connection points of the gate to its support post may present serious pinch or crush hazards.

CPSC **5.6.1.1-C** No specific requirement by CPSC.

5.6.2 LOG ROLLS

CFA **5.6.2.1-A** Log or barrel rolls shall not be included in play areas designed for preschool-age children.

Rationale: Preschool-age children do not have the requisite body strength or coordination to control this type of equipment.

CPSC **5.6.2.1-C** No specific requirement by CPSC.

5.6.3 MERRY-GO-ROUNDS

Merry-go-rounds are a common type of rotating equipment. Most merry-go-rounds consist of a circular base, close to the ground, which children either sit or stand on and that rotates when pushed. Some merry-go-rounds designed for younger children are a concave, dish-like platform in which children sit.

CFA/CPSC **5.6.3.1-B** The rotating base of all merry-go-rounds shall be continuous and approximately circular.

CFA/CPSC **5.6.3.2-B** The difference between the minimum and maximum radii of a non-circular base shall not exceed 2 inches (see Figure 5-7).

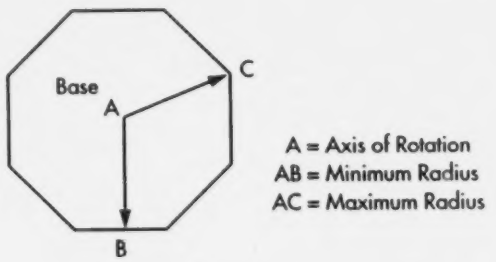


Figure 5-7: Minimum and Maximum Radii of Non-circular Merry-go-Round Platforms[36]

CFA/CPSC **5.6.3.3-B** There shall not be any accessible shearing or crushing mechanisms in the undercarriage of the equipment.

CFA **5.6.3.4-A** The rotating base shall be solid and preclude access to the undercarriage and rotating mechanism of the merry-go-round.

Rationale: The undercarriage and rotating mechanism of merry-go-rounds should be totally enclosed to eliminate all potential pinch, crush, and shearing hazards.

[36] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CPSC	**5.6.3.4-C**	The surface of the platform shall be continuous with no openings between the axis and the periphery that permit a rod having a diameter of 5/16-inch to penetrate completely through the surface.
CFA	**5.6.3.5-A**	The diameter of the rotating base shall not exceed 4 feet. *Rationale: One means of reducing the frequency and severity of injuries associated with merry-go-rounds is to limit the size of their rotating base.*
CPSC	**5.6.3.5-C**	No specific requirement by CPSC.
CFA/CPSC	**5.6.3.6-B**	The rotating base shall not have any sharp edges.
CFA/CPSC	**5.6.3.7-B**	Nothing shall protrude beyond the outer edge of the rotating base.
CFA/CPSC	**5.6.3.8-B**	All merry-go-rounds, with or without seats, shall provide a means of hand support.
CFA/CPSC	**5.6.3.9-B**	Handrails or handgrips provided on merry-go-rounds shall conform to the general requirements for the diameter of hand-gripping components (see Section 5.2.3) as well as to all protrusion requirements (see Section 4.7.2.7).
CFA/CPSC	**5.6.3.10-B**	Merry-go-rounds shall not be equipped with an oscillatory (up and down) motion.
CFA/CPSC	**5.6.3.11-B**	A means shall be provided to limit the peripheral speed of rotation to a maximum of 13 ft./sec.
CFA/CPSC	**5.6.3.12-B**	The underside of the perimeter of the rotating platform shall be no less than 9 inches above the level of the protective surfacing.
CFA	**5.6.3.13-A**	The standing surface of merry-go-rounds shall no more than 1 foot above the protective surfacing. When seats are provided on merry-go-rounds, the height of the seats shall be no more than 2 feet above the protective surfacing.
CPSC	**5.6.3.13-C**	No specific requirement by CPSC.

CFA/CPSC **5.6.3.14-B** Merry-go-rounds shall be located away from other play events, preferably at the edge of the play area.

Rationale: Because of the increased risk of injuries associated with moving equipment, it should be separated from other equipment.

CFA **5.6.3.15-A** Because young children cannot control merry-go-rounds once they are on the equipment and it is in motion, it is recommended that merry-go-rounds be included only in play areas where there is constant adult supervision.

CPSC **5.6.3.15-C** No specific requirement by CPSC.

5.7 Seesaws

Traditional seesaws consist of a board or pole with a seat at each end, supported at the center by a fulcrum.

Given a lack of control and unpredictability, there are inherent hazards in the design of traditional fulcrum seesaws -- especially for preschool-age children -- because safe use depends on the cooperative and complementary behavior of two children.

Spring-loaded seesaws are now available, offering children a much safer alternative. In these designs, the center of the seesaw has a spring base which prevents either end from hitting the ground should one child decide to dismount but still provides a similar up-and-down motion. The spring mechanism helps reduce the risk of impact injuries due to abrupt contact with the ground. Some spring-loaded seesaws have two seats, and others have four.

5.7.1 TRADITIONAL FULCRUM SEESAWS

CFA/CPSC **5.7.1.1-B** Fulcrum seesaws shall not be included in play areas designed for preschool-age children.

Rationale: Fulcrum seesaws require body control and coordination that most preschool-age children have not yet developed. Further, young children are at increased risk of falls and impact injuries because most will not be able to relate their actions to those of the other user, which is essential for safe use of traditional seesaws.

5.7.2 SPRING-LOADED SEESAWS

CFA/CPSC **5.7.2.1-B** For preschool-age children, it is recommended that spring-loaded seesaws be substituted for traditional fulcrum seesaws.

CFA **5.7.2.2-A** Spring-loaded seesaws shall follow the requirements of Section 5.8.1 and Section 5.8.2.

CPSC **5.7.2.2-C** No specific requirement by CPSC.

5.8 Spring Rocking Equipment

Spring rocking equipment may be in the form of individual seat assemblies mounted on a spring mechanism or consist of several seat assemblies linked by a common spring mechanism (i.e., a spring-loaded seesaw).

Although very young children enjoy and benefit developmentally from individual spring rockers, this equipment typically does not present enough challenge to interest older children. Older preschoolers may prefer spring-loaded seesaws. And school-age children tend to prefer spring platforms.

5.8.1 SPRINGS

CFA/CPSC **5.8.1.1-B** The spring mechanism of rocking equipment shall minimize the possibility of children pinching either their hands or feet between coils of the spring or between the spring and part of the rocker.

5.8.2 SEAT ASSEMBLIES

The requirements for seat assemblies apply to individual spring rockers as well as spring-loaded seesaws.

CFA/CPSC **5.8.2.1-B** Seat design shall not allow the rocker to be used by more than the intended number of children at one time.

CFA/CPSC **5.8.2.2-B** Handholds shall be provided for each seat position on spring rocking equipment and shall conform to the general requirements for the diameter of hand-gripping components (see Section 5.2.3) as well as to all protrusion requirements (see Section 4.7.2.7).

CFA/CPSC **5.8.2.3-B** Footrests shall be provided for each seat position on spring rocking equipment and shall conform to all protrusion requirements (see Section 4.7.2.7).

CFA **5.8.2.4-A** There shall be a minimum distance of 36 inches between independent spring rockers or between adjacent seat assemblies on spring rocking equipment such as a four-way spring-loaded seesaw. This minimum

clearance does not apply when an independent spring rocker has a single seat assembly designed for more than one user to sit together.

Rationale: This requirement is intended to prevent potentially hazardous interaction between children on adjacent seat assemblies of spring rocking equipment.

CPSC **5.8.2.4-C** No specific requirement by CPSC.

CFA **5.8.2.5-A** Seat assemblies of rocking equipment shall be no higher than 24 inches above the protective surfacing when at rest and unoccupied.

Rationale: This maximum height is intended to limit potential fall heights while accommodating the waist height of the largest user, assuming that 5-year-olds are the typically the oldest users of spring rockers. The waist height of a 95th percentile 5-year-old is 26.3. Since children actively climb up onto the equipment, this 24-inch height is also reasonable from the standpoint of smaller, younger users.

CPSC **5.8.2.5-C** No specific requirement by CPSC.

5.8.3 SPRING PLATFORMS

CFA **5.8.3.1-A** The standing surface of spring platforms shall not be higher than 18 inches above the protective surfacing.

Rationale: It is important to limit the height of spring platforms given the potential for falls.

CPSC **5.7.2.2-C** No specific requirement by CPSC.

Section 6

SAFETY AND DESIGN REQUIREMENTS FOR PLAY AREAS INTENDED FOR USE BY SCHOOL-AGE CHILDREN

6.1 Climbing Components
6.1.1 General Requirements
6.1.2 Ramps
6.1.3 Stairways, Step Ladders, and Rung Ladders
6.1.4 Spiral Stairways
6.1.5 Arch Ladders
6.1.6 Climbing Events with Flexible Components
6.1.7 Sliding Poles
6.1.8 Turning or Chinning Bars
6.1.9 Parallel Bars
6.1.10 Overhead Horizontal Ladders
6.1.11 Overhead Rings
6.1.12 Track Rides
6.1.13 Climbing Ropes
6.1.14 Suspension Bridges
6.1.15 Balance Beams
6.1.16 Chain or Cable Walks

6.2 Hand-Gripping Components
6.2.1 Handrails
6.2.2 Others Handholds
6.2.3 Diameter of Hand-Gripping Components

6.3 Platforms and Other Elevated Play Surfaces
6.3.1 General Requirements
6.3.2 Guardrails and Protective Barriers
6.3.3 Stepped Platforms

6.4 Slides
6.4.1 Access to Slides and Slide Platforms
6.4.2 Slide Chute Entrance
6.4.3 Sliding Surface
6.4.4 Exit Region

6.5 Swings
6.5.1 General Requirements
6.5.2 Single-Axis Swings
6.5.3 Multiple-Axis Swings

6.6 Rotating Equipment
6.6.1 Swinging Gates
6.6.2 Log Rolls
6.6.3 Merry-Go-Rounds

6.7 Seesaws
6.7.1 Traditional Fulcrum Seesaws
6.7.2 Spring-Loaded Seesaws

6.8 Spring Rocking Equipment
6.8.1 Springs
6.8.2 Seat Assemblies
6.8.3 Spring Platforms

Important Note:

This document contains numbered items which are **requirements** that could be adopted as law. In some cases, CFA provides **rationale** for the requirement, shown in italicized text immediately the requirement. Where appropriate, CFA also give introductory comments and explanations at the beginning of major sections. In some general content areas, CFA offers additional information, intended as guidance only not as requirements.

Each requirement has its own identification number and is labeled with an **A**, **B**, or **C**. The labeling codes are as follows.

- Requirements labeled with an **A** are specifications of **CFA only**.
- Requirements labeled with a **B** are specifications of both **CFA and CPSC**.
- Requirements labeled with a **C** are specifications of **CPSC only**.

In order to follow the similarities and differences between the CFA and CPSC requirements, pay close attention to the numbers assigned to each requirement For every CFA model law provision, we have noted whether CPSC has the same requirement, a different requirement, or no requirement. This CFA report addresses every issue addressed by the 1997 CPSC handbook; the majority of these provisions are the same. However, CFA also addresses a substantial number of issues not addressed by CPSC. So for each requirement, there are three possibilities with respect to CFA and CPSC versions, as follows.

- In many cases, CFA and CPSC recommend the same specification. A requirement included by both CFA and CPSC will appear only once and its identification number will be labeled with a **B**.
- Where CFA and CPSC both address the same issue but the CFA specification is more stringent, the CFA and CPSC requirements are each given the same identification number but the CFA version is labeled with an **A** while the CPSC version is labeled with a **C**.
- Where CFA addresses an issue that is not addressed by CPSC, again there are **A** and **C** versions for the same identification number. The **A** specification provides CFA's requirement while the **C** specification indicates "No specific requirement by CPSC."

There are no cases in which a CFA and CPSC requirement conflict. If a piece of play equipment or play area complies with all CFA specifications, it also complies with all CPSC specifications. However, a piece of play equipment or play area could comply with all CPSC specifications without complying with all CFA specifications because CFA addresses additional issues or is more stringent in some cases.

To adopt all CFA specifications, adopt requirements labeled with either an A or B. This approach would include a complete representation of the 1997 CPSC guidelines while also going beyond the scope of CPSC to address additional content areas and to provide more stringent specifications in some areas. It is important to recognize that CFA makes many more developmental distinctions than CPSC, providing different requirements for preschool-age and school-age children.

To adopt all CPSC specifications but not additional or more stringent CFA specifications, adopt requirements labeled with either a B or C. Because all CPSC specifications are included in this document, this approach would include a complete representation of the 1997 CPSC guidelines.

6.1 Climbing Components

Most climbing components serve as a means of access to or egress from another play event or events on a composite structure. Some, however, may also be designed as separate play events.

Climbing components vary greatly in their level of challenge. The least challenging climbing components include: ramps, stairways, step ladders, stepped or layered platforms, stepping timbers, balance beams, tunnels, and solid bridges. Climbing components that present an intermediate challenge include: rung ladders, suspension bridges, chinning bars, parallel bars, and dome climbers. Structures that require more advanced coordination and balance for successful climbing and, therefore, present greater challenges include: arch ladders, tire climbers, net climbers, and sliding poles. In addition, because upper body equipment such as overhead horizontal ladders and overhead rings require children to support all of their weight with their hands (as compared to other climbing components which allow foot support as well), they can be especially difficult to maneuver.

6.1.1 GENERAL REQUIREMENTS

CFA **6.1.1.1-A** All play areas shall provide a range of challenge with a variety of climbing components.

Rationale: When children can make choices and select play events suited to their individual skill levels, they are less likely to get hurt.

CPSC **6.1.1.1-C** No specific requirement by CPSC.

CFA/CPSC **6.1.1.2-B** Climbing equipment shall allow children to descend as easily as they ascend. To do so, play equipment shall offer multiple means of access/egress of varying challenge. For example, a stairway can provide a less challenging egress option while a vertical rung ladder provides a more challenging access option.

Rationale: This design strategy contributes to safer use of both composite structures and separate play events, particularly free-standing slides. Offering an easy way out is particularly important for the youngest children in this age group, since the ability to descend a specific climbing component often emerges later the ability to climb up the same component.

CFA/CPSC **6.1.1.3-B** Composite structures shall be designed so that the mode of use, level of challenge, and play and traffic patterns of adjacent components are compatible.

CFA	**6.1.1.4-A**	Climbing equipment shall not have any obstructions, climbing rungs, or structural components on the interior of the structure which could interrupt a fall to the protective surfacing below and cause an impact injury. *Rationale: Falls onto rigid components from any height can cause serious injuries.* *Note: This requirement is intended to eliminate the old-style multi-tiered, cubical "jungle gyms."*
CPSC	**6.1.1.4-C**	Climbers shall not have any climbing bars or other structural components in the interior of the structure onto which a child may fall from a height of greater than 18 inches.
CFA	**6.1.1.5-A**	The fall height of climbing equipment -- which is the height of the highest climbing component -- shall not exceed 6 feet above the protective surfacing. *Limiting potential fall heights is critical, because most climbing equipment-related injuries are caused by falls and because falls cause the most serious injuries.*
CPSC	**6.1.1.5-C**	No specific requirement by CPSC.
6.1.2	**RAMPS**[37]	
CFA/CPSC	**6.1.2.1-B**	**Access Slope** -- The slope of ramps shall not exceed 1 foot to 8 feet (vertical to horizontal). *Rationale: This maximum slope for ramps is consistent with BOCA National Building Codes. It is not, however, intended to address ramps designed for disabled access.*
CFA/CPSC	**6.1.2.2-B**	**Width** • Ramps intended for single-file use shall be at least 16 inches wide. • Ramps intended for use by more than one child at a time shall be at least 36 inches wide.

[37]These specifications for ramps are not intended to address ramps used for compliance with the ADA and access by disabled children. Instead, they are intended only for ramps designed as climbing components.

Rationale: The minimum width for single-file ramps is based on the shoulder breadth of the largest user; the shoulder breadth of a 95th percentile 12-year-old is 15.7 inches. The minimum width for ramps for use by more than one child at a time is based on twice the shoulder breadth of the largest user plus an allowance for space between children.

6.1.3 STAIRWAYS, STEP LADDERS, AND RUNG LADDERS

Stairways, step ladders, and rung ladders are distinguished by the range of slopes permitted for each of these types of access. With increasing slope, challenge also increases.

Stairways have steps intended primarily for foot support. Step ladders also have steps, but due to their steeper slopes, are intended to require foot support as well as a limited degree of hand support -- there is more climbing involved when negotiating a step ladder than a stairway. Rung ladders require even more climbing, and the rungs are intended to be used for both hand and foot support.

CFA	**6.1.3.1-A**	All steps and rungs shall be securely attached to their side supports and shall not turn or wobble when stepped on or grasped.
CPSC	**6.1.3.1-C**	No specific requirement by CPSC.
CFA	**6.1.3.2-A**	All steps and rungs shall be horizontal within a tolerance of ± 2 degrees.
CPSC	**6.1.3.2-C**	No specific requirement by CPSC.
CFA/CPSC	**6.1.3.3-B**	When risers on stairways or stepladders are closed, their design shall allow for drainage and prevent the accumulation of debris. Drainage holes shall preclude finger entrapment and pinching.
CFA/CPSC	**6.1.3.4-B**	All steps and rungs on stairways and ladders shall be evenly spaced. This requirement also applies to the distance between the top step or rung and the underside of the platform it serves.
CFA/CPSC	**6.1.3.5-B**	**Access Slope** • Stairways shall have slopes no greater than 35 degrees. • Step ladders shall have slopes between 60 and 75 degrees. • Rung ladders shall have slopes between 75 and 90 degrees.

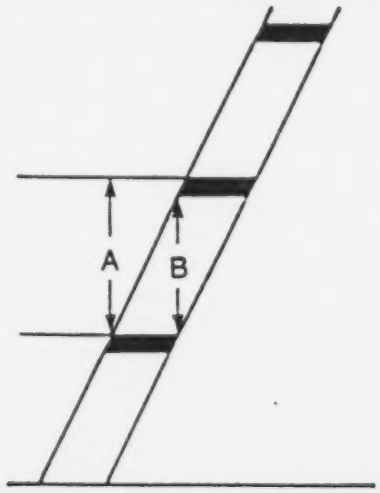
CFA/CPSC **6.1.3.6-B** **Vertical Rise** -- Vertical rise is the tread-to-tread distance between two consecutive steps or rungs. The same requirements apply to the distance between the top step or rung and the underside of the platform it serves.

On stairways and step ladders, vertical rise shall not exceed 12 inches (see Figure 6-1). Unless the distance between interior opposing surfaces of consecutive steps is less than 3.5 inches or greater than 9 inches, all risers shall be closed to conform with the entrapment criteria (see Section 4.7.4).

On rung ladders, vertical rise shall not be greater than 12 inches (see Figure 6-1). To satisfy the entrapment criteria (see Section 4.7.4) and because the design of rung ladders does not allow closed risers, the distance between interior opposing surfaces of consecutive rungs shall not be between 3.5 and 9 inches.

Rationale: The vertical rise of steps shall simultaneously meet two criteria: (1) The distance between interior opposing surfaces of consecutive steps or rungs as well as the distance between the top step or rung and the underside of the platform it serves shall preclude the possibility of entrapment. Entrapment criteria prohibit openings with an interior dimension between 3.5 and 9 inches.
(2) The distance between the top surfaces of consecutive steps shall not exceed the step height of the smallest user. The step height of a 5th percentile 5-year-old is 12.5 inches.

Rung ladders shall also satisfy entrapment criteria; however, the vertical rise may slightly exceed the step height of the smallest user since rung ladders are intended to be climbed using both hand and foot support.



A is the vertical rise between consecutive steps or rungs, which is the vertical distance from tread to tread.

B is the distance between interior opposing surfaces of consecutive steps or rungs, which is subject to entrapment requirements.

Stairways and Stepladders
For school-age children, **A** must not exceed 12 inches and unless **B** is smaller than 3.5 inches or greater than 9 inches the openings between steps must be closed to preclude entrapment.

Rung Ladders
For school-age children, **A** must not exceed 12 inches and **B** must not be between 3.5 inches and 9 inches to preclude entrapment.

Figure 6-1: Vertical Rise Criteria[38]

[38] This Figure is an adaptation of a Figure in the Comsis Report (Ratté et al., 1990).

CFA/CPSC **6.1.3.7-B** **Tread or Rung Width**

- Stairways intended for single-file use shall be at least 16 inches wide.
- Stairways intended for use by more than one child at a time shall be at least 36 inches wide.
- Rung ladders shall be at least 16 inches wide.

Rationale: The minimum tread and rung widths are based on the shoulder breadth of the largest user; the shoulder breadth for a 95th percentile 12-year-old is 15.7 inches.

Because older children can manage either stairways or step ladders without the use of handrails on both sides, they can both be wider than single-file. For stairways and step ladders intended for use by more than one child at a time, the minimum width is based on twice the shoulder breadth of the largest user plus an allowance for space between children.

No maximum is specified for rung ladders since their intended use involves both hand and foot support which can be provided by the rungs themselves.

CFA/CPSC **6.1.3.8-B** **Tread Depth**

- On stairways with either open or closed risers, tread depth shall be at least 8 inches.
- On step ladders with open risers, tread depth shall be at least 3 inches.
- On step ladders with closed risers, tread depth shall be at least 6 inches.

Rationale: Because stairways rely primarily on foot support, a greater contact area for the feet is required, regardless of whether risers are open or closed. In contrast, step ladders require smaller contact areas for the feet because hand support and upper body strength contribute to climbing. The values specified are based on the length of a 95th percentile 12-year-old's foot, which is 10 inches.

CFA/CPSC **6.1.3.9-B** **Rung Diameter** -- Rungs shall meet the general requirements for the diameter of hand-gripping components (see Section 6.2.3).

6.1.4 SPIRAL STAIRWAYS

CFA **6.1.4.1-A** Spiral stairways shall meet the general criteria above for straight stairways as well as those regarding slope, vertical rise, and tread width (see Sections 6.1.3.1 through 6.1.3.7).

CPSC **6.1.4.1-C** No specific requirement by CPSC.

CFA **6.1.4.2-A** Tread depth at the outer edge of steps on a spiral stairway shall be at least 8 inches.

Rationale: When combined with requirements for tread width, the above requirement ensures that children have an adequate contact area for their feet when climbing spiral stairways.

CPSC **6.1.4.2-C** No specific requirement by CPSC.

6.1.5 ARCH LADDERS

Arch ladders consist of metal rungs or wood members attached to convex side supports.

CFA/CPSC **6.1.5.1-B** Arch ladders shall not be the sole means of access to play equipment.

Rationale: Arch ladders are considered to be one of the more challenging climbing components. Providing a less challenging mode of access/egress, such as a stairway or step ladder, will ensure that children use the arch ladder because they want to assume its challenge not because they are forced to use it.

CFA **6.1.5.2-A** The top climbing member of an arch ladder shall be no higher than 4 feet above the protective surfacing.

Rationale: Given the added challenge of arch ladders, a lower maximum fall height is warranted since falls are common during the transitions from climbing an access/egress component to standing on the platform.

CPSC **6.1.5.2-C** No specific requirement by CPSC.

CFA **6.1.5.3-A** The top climbing member of an arch ladder used as an access/egress component shall be at or below the level of the platform it serves.

Rationale: This requirement is intended to facilitate the transition from climbing to standing. If the top member of an arch ladder used as an access/egress component is located above the platform it serves, children may have difficulty making this transition and will be at increased risk of falls.

CPSC **6.1.5.3-C** No specific requirement by CPSC.

CFA/CPSC **6.1.5.4-B** The openings formed by the climbing members of an arch ladder shall conform to the entrapment criteria (see Section 4.7.4).

CFA/CPSC **6.1.5.5-B** Rungs used on arch ladders shall conform to the general requirements for the diameter of hand-gripping components (see Section 6.2.3).

6.1.6 CLIMBING EVENTS WITH FLEXIBLE COMPONENTS

Play events such as net or chain climbers (which consist of a grid of cables or chains) or tire climbers (which may have tires secured tread-to-tread in the form of a sloping grid or suspended individually by chains or some other means) are classified as climbing events with flexible components. Since these climbing events do not provide a steady means of support and, therefore, require more advanced balance abilities, special consideration and caution is warranted.

CFA/CPSC **6.1.6.1-B** Climbing events with flexible components shall not be the sole means of access to play equipment.

Rationale: Climbing events with flexible components are considered to be one of the more challenging climbing components. Providing a less challenging mode of access/egress such as a stairway or step ladder, will ensure that younger children use the climbing event with flexible components because they want to assume its challenge not because they are forced to use it.

CFA **6.1.6.2-A** The top climbing member of a climbing event with flexible components shall be no higher than 5 feet above the protective surfacing.

Rationale: Given the added challenge of a climbing event with flexible components, a lower maximum fall height is warranted since falls are common during the transitions from climbing an access/egress component to standing on the platform .

CPSC **6.1.6.2-C** No specific requirement by CPSC.

CFA **6.1.6.3-A** The top climbing member of a climbing event with flexible component used as an access/egress component shall be at or below the level of the platform it serves.

Rationale: This requirement is intended to facilitate the transition from climbing to standing. If the top member of a climbing event with flexible component used as an access/egress component is located above the platform it serves, children may have difficulty making this transition and will be at increased risk of falls.

CPSC **6.1.6.3-C** No specific requirement by CPSC.

CFA/CPSC **6.1.6.4-B** All connections between ropes, cables, chains, or tires shall be securely fixed.

CFA/CPSC **6.1.6.5-B** All openings within climbing events with flexible components or formed between their components and other structural components shall conform to the entrapment criteria (see Section 4.7.4).

CFA/CPSC **6.1.6.6-B** The perimeter length of the openings in climbing nets (the sum of the length of all four sides) shall not be between 17 and 28 inches to preclude head entrapment.

Rationale: For climbing nets, special attention to entrapment hazards is warranted due to known patterns of injury and the potential for strangulation.

SAFETY ALERT: CPSC issued a warning about head entrapment hazards in climbing nets because such hazards can cause strangulation (see Appendix A). Openings must either be too small to permit entry of a child's body or large enough to permit free passage of a child's head.

CFA/CPSC **6.1.6.7-B** Climbing events with flexible components shall be securely fixed at both ends. When one end is connected to the ground, anchoring devices shall be below ground beneath the base of the protective surfacing material to prevent trip hazards.

6.1.7 SLIDING POLES

CFA **6.1.7.1-A** Sliding poles shall not be the sole means of access to or egress from play equipment.

Rationale: Sliding poles are considered to be one of the more challenging climbing components. Providing a less challenging mode of access/egress such as a stairway or step ladder, will ensure that children use the sliding pole because they want to assume its challenge not because they are forced to use it.

CPSC **6.1.7.1-C** No specific requirement by CPSC.

CFA/CPSC **6.1.7.2-B** Sliding poles shall be continuous with no protruding bolts or seams along the sliding surface.

CFA/CPSC **6.1.7.3-B** Sliding poles shall not change directions along the sliding portion.

CFA/CPSC **6.1.7.4-B** The horizontal distance between a sliding pole and the edge of the platform or other structure used for access shall be at least 18 inches; this minimum distance shall be satisfied along the entire length of the pole.

No point on the sliding pole at or above the level of the access structure, where a child is likely to reach for the pole, shall be more than 20 inches away from the access structure.

Rationale: The requirements for minimum and maximum distances between a sliding pole and its access structure ensure that there is sufficient body clearance for the largest user to slide down the pole unimpeded while simultaneously presenting a reasonable challenge for the reaching abilities of the minimum user.

CFA/CPSC **6.1.7.5-B** The sliding pole shall extend at least 60 inches above the level of the access structure.

Rationale: This requirement is intended to help children maintain a balanced position while grasping the pole to begin their descent, ensuring that both younger and older children in this age group can comfortably reach and mount the pole.

CFA/CPSC **6.1.7.6-B** The diameter of a sliding pole shall not exceed 1.9 inches.

Rationale: This value allows the pole to have structural integrity and stability while also accommodating relatively good grip strength and the hand sizes of anticipated users.

CFA/CPSC **6.1.7.7-B** Sliding poles and their access structures shall be designed and located so that traffic from other play events will not interfere with the user's descent.

6.1.8 TURNING OR CHINNING BARS

CFA **6.1.8.1-A** Turning or chinning bars shall have a circular cross-section.

CPSC **6.1.8.1-C** No specific requirement by CPSC.

CFA **6.1.8.2-A** The diameter of turning or chinning bars shall conform to the general requirements for the diameter of hand-gripping components (see Section 6.2.3).

CPSC **6.1.8.2-C** No specific requirement by CPSC.

CFA **6.1.8.3-A** Turning or chinning bars shall be at least 4 feet but not more than 6 feet above the protective surfacing.

Rationale: This range of acceptable heights for turning bars is intended to ensure that the largest users will not hit their head when hanging from their knees while also ensuring that the smallest users will not have too much difficulty mounting the equipment. The distance from the largest user's head to knees was estimated by subtracting knee height from stature for a 95th percentile 12-year-old; this value is 42.6 inches.

CPSC **6.1.8.3-C** No specific requirement by CPSC.

6.1.9 PARALLEL BARS

CFA **6.1.9.1-A** Parallel bars shall be at least 1 7/8 inches but not more than 2 1/2 inches in diameter.

Rationale: This minimum diameter is required to ensure adequate structural integrity of the bars, and the maximum diameter is required to ensure that children can grasp enough of the bar for safe use.

CPSC **6.1.9.1-C** No specific requirement by CPSC.

CFA	**6.1.9.2-A**	Parallel bars shall be between 18 and 24 inches apart, center-to-center. *Rationale: This range will accommodate the shoulder breadth and arm length of both the smallest and largest intended users.*
CPSC	**6.1.9.2-C**	No specific requirement by CPSC.
CFA	**6.1.9.3-A**	Parallel bars shall not exceed 3 feet in height above the protective surfacing. *Rationale: Limiting the height of parallel bars is an essential means of reducing fall injuries, given the added challenge of this play event. This maximum height, however, accommodates the chest heights of both the smallest and largest intended users.*
CPSC	**6.1.9.3-C**	No specific requirement by CPSC.

6.1.10 OVERHEAD HORIZONTAL LADDERS

CFA/CPSC	**6.1.10.1-B**	All spaces between rungs on overhead horizontal ladders shall conform to the entrapment criteria (see Section 4.7.4).
CFA/CPSC	**6.1.10.2-B**	The distance between consecutive handholds on overhead horizontal ladders shall not exceed 15 inches, center-to-center.
CFA/CPSC	**6.1.10.3-B**	The first handhold on either end of an overhead horizontal ladder shall not be placed directly above the platform or climbing rung used for mount or dismount.
CFA	**6.1.10.4-A**	The horizontal distance between the first handhold on an overhead horizontal ladder and its access/egress structure, at both ends of the horizontal ladder, shall be between 8 and 10 inches. *Rationale: This requirement is intended to facilitate mount and dismount of upper body equipment by ensuring that the first handhold at either end is reachable for the smallest user while also minimizing the risk of an impact incident if a child falls from the first handhold.*
CPSC	**6.1.10.4-C**	No specific requirement by CPSC.

CFA/CPSC **6.1.10.5-B** The maximum height of handholds on overhead horizontal ladders shall not exceed 84 inches from the protective surfacing.

Rationale: A separate maximum height requirement is warranted for upper body equipment due to their design and mode of use. The 84-inch requirement corresponds to the vertical grip reach of the maximum user plus an allowance for ground clearance. The vertical grip reach of a 95th percentile 12-year-old is 78.2 inches.

CFA **6.1.10.6-A** The maximum height of an access/egress structure serving an overhead horizontal ladder shall not exceed 36 inches above the protective surfacing.

Rationale: The distance between the top of the access/egress structure and the first handhold must accommodate the vertical grip reach of the smallest user without making the equipment difficult for the largest user to mount/dismount. The vertical grip reach of a 5th percentile 5-year-old is 44.8 inches.

CPSC **6.1.10.6-C** No specific requirement by CPSC.

CFA/CPSC **6.1.10.7-B** Overhead horizontal ladders shall be located so that children traversing the ladder cannot interfere with the play of children on adjacent play events, particularly with their descent on slides.

Rationale: The swinging movements of children generated on overhead horizontal ladders warrant special precautions to reduce the risk of impact with children on adjacent play events.

CFA/CPSC **6.1.10.8-B** The design of structures and play events adjacent to overhead horizontal ladders shall not facilitate climbing on its top support bars.

6.1.11 OVERHEAD RINGS

CFA/CPSC **6.1.11.1-B** Overhead rings shall conform to all requirements for overhead horizontal ladders specified in Section 6.1.10, except 6.1.10.1 and 6.1.10.2.

Rationale: The requirement regarding the center-to-center distance of rungs on overhead horizontal ladders does not apply to the spacing of overhead rings because, during use, the gripped ring swings through an arc and reduces the distance to the gripping surface of the next ring.

CFA/CPSC **6.1.11.2-B** Overhead rings shall conform to all entrapment criteria (see Section 4.7.4).

CFA/CPSC **6.1.11.2-B** If overhead rings suspended by chains, the maximum length of the chains shall be 12 inches.

Rationale: Chains longer than 12 inches would place children running through the play area at great risk of impact injuries from the rings which are often made of heavy metal.

6.1.12 TRACK RIDES

A track ride generally consists of a handle or bar that children hold on to and hang freely from in a vertical position while it slides along a cable or cross beam horizontally. There may be a platform on one or both ends of the track ride where children can get on and off.

CFA **6.1.12.1-A** Track rides shall not be included in public play areas, regardless of the age of intended users.

Rationale: Younger children typically do not have the requisite upper body strength for track rides, and older children often misuse this kind of equipment. Moreover, if poorly designed or not well maintained, track rides may achieve excessive speeds. At higher speeds, children are likely to have more difficulty making the transition when getting off the track ride -- increasing the risk of a fall or impact with a support structure, both of which can cause serious injury. Improper design or maintenance may also cause failure of the handhold device to traverse the entire length of the cable or cross beam. In this case, a child may be stranded in the middle of the track ride; the risk of fall injuries is then increased for many reasons, including the likelihood that another child, or adult, will try to help the stranded child down while balance and center of gravity are comprised by their awkward positions.

CPSC **6.1.12.1-C** No specific requirement by CPSC.

6.1.13 CLIMBING ROPES

CFA **6.1.13.1-A** Individual climbing ropes shall not be included in public play areas, regardless of the age of intended users.

Rationale: A free swinging rope presents a significant risk of injury caused by moving impact incidents, particularly because children have less control of a free swinging rope than they do of a swing. In addition, either a free swinging rope or a climbing rope originally anchored at both ends that becomes unattached may be looped back on itself and form a noose. Braided or twisted ropes have also been known to fray or become loose and thus present entanglement and strangulation hazards.

CPSC **6.1.13.1-C** A climbing rope shall be secured at both ends and not be capable of being looped back on itself creating a loop with an inside perimeter greater than 5 inches.

6.1.14 BRIDGES

Bridges are often included on composite play structures to connect two decks. Some are flat, while others are arched. In addition, some can be classified as flexible bridges because provide motion as children walk or run across.

CFA **6.1.14.1-A** Bridges shall not be any wider than the outer width of its support structure.

CPSC **6.1.14.1-C** No specific requirement by CPSC.

CFA **6.1.14.2-A** The two platforms from which a bridge is suspended shall have equal heights so that the bridge has the same elevation on each end.

CPSC **6.1.14.2-C** No specific requirement by CPSC.

CFA **6.1.14.3-A** Spaces between planks of a bridge as well as any openings between the first plank on either end and the platform shall not present pinch or crush hazards (see Section 4.7.3).

CPSC **6.1.14.3-C** No specific requirement by CPSC.

CFA **6.1.14.4-A** Spaces between planks of a bridge as well as any openings between the first plank on either end and the platform shall conform to all entrapment criteria (see Section 4.7.4).

CPSC **6.1.14.4-C** No specific requirement by CPSC.

CFA **6.1.14.5-A** Bridges shall conform to all criteria for elevated surfaces (see Section 6.3), including the requirements for guardrails or protective barriers.

CPSC **6.1.14.5-C** No specific requirement by CPSC.

6.1.15 BALANCE BEAMS

CFA **6.1.15.1-A** Balance beams shall be no higher than 12 inches.

Rationale: This maximum height corresponds to the approximate crotch height of the smallest user, in this case taking the younger age group into account for added safety; the gluteal furrow height of a 5th percentile 2-year-old is 11.5 inches. Additional height is not necessary for play value.

CPSC **6.1.15.1-C** Balance beams shall be no higher than 16 inches.

CFA **6.1.15.2-A** Balance beams shall be located out of high traffic areas to avoid tripping hazards.

CPSC **6.1.15.2-C** No specific requirement by CPSC.

6.1.16 CHAIN OR CABLE WALKS

Chain or cable walks generally consist of a pair of chains or cables suspended in the same vertical plane, one low to the ground for children to stand and walk on and one up above for children to hold on to as a balancing activity. Often, two pairs are suspended near one another as a double chain or cable walk. There may be a platform at one or both ends, or the chains or cables may be suspended only from independent support posts.

CFA **6.1.16.1-A** Chain or cable walks shall not be included in public play areas, regardless of the age of intended users.

Rationale: Chain or cable walks present tripping hazards and a significant risk of falls and impact injuries. Double chain or cable walks present an even greater risk of serious impact injuries since a child who trips on the first chain or cable may fall and land on the second. Given the small diameter of the chains or cables, their motion, and because they are very slippery with any wetness, the high challenge level of this play event becomes hazardous for most children. Other play events can be included

on playgrounds to provide safer, more appropriate balance activities and challenges.

In addition, if not well maintained, children may have access to a chain or cable attached only on one end which presents the risk of strangulation. Children may also attempt to use an unattached chain or cable as a free swinging rope, presenting a risk of moving impact injuries.

CPSC **6.1.16.1-C** No specific requirement by CPSC.

6.2 Hand-Gripping Components

Handrails and other handholds are essential in helping steady children as they negotiate climbing components, and thus add protection against falls and injuries.

6.2.1 HANDRAILS

CFA/CPSC **6.2.1.1-B** Continuous handrails shall be provided on both sides and along the entire length of all stairways and step ladders.

Rung ladders do not require handrails since rungs or side supports provide hand support on these more steeply inclined climbing components.

Rationale: Handrails are a critical means of support that help children maintain balance while climbing up or down the access/egress component. The design of handrails shall be continuous so that children do not have to remove their hands while climbing.

CFA **6.2.1.2-A** For spiral stairways, a continuous handrail shall be provided at least along the outer edge.

CPSC **6.2.1.2-C** No specific requirement by CPSC.

CFA/CPSC **6.2.1.3-B** Handrails shall be available for use at the appropriate height beginning with the first step.

CFA/CPSC **6.2.1.4-B** Handrail height, which is the vertical distance between the top front edge of a step (tread nosing) and the top surface of the handrail above it, shall be greater than 22 inches but less than 38 inches.

Rationale: The values required for handrail height are based on the approximate elbow height of the smallest and largest users; the elbow heights for a 5th percentile 5-year-old and a 95th percentile 12-year-old were estimated as the difference between suprasternale height and shoulder-to-elbow length. A range is allowed because children are likely to grasp handrails above elbow height and sometimes even at or above shoulder height. Note, however, that because the shoulder height (suprasternale height) of the smallest user, a 5th percentile 5-year-old, is 30.5 inches, handrail heights at the upper end of the range may present some difficulty to the smallest children..

CFA/CPSC **6.2.1.5-B** Handrails shall extend high enough at the top of the access to provide support until a child fully achieves the desired posture on the platform.

CFA/CPSC **6.2.1.6-B** Any openings formed by handrails and structural components of the play equipment shall conform to the entrapment criteria (see Section 4.7.4).

CFA/CPSC **6.2.1.7-B** All handrails and other means of hand support shall be securely fixed and not turn or wobble when grasped.

6.2.2 OTHER HANDHOLDS

CFA/CPSC **6.2.2.1-B** Hand support shall be provided to facilitate a child's transition from climbing to standing for climbing components which serve as access/egress to platforms and other play events but that do not have traditional handrails. Options for other handholds include vertical handrails and loop handgrips, which may extend out over the top of the access.

CFA **6.2.2.2-A** Single, overhead horizontal bars are not recommended as an alternate means of hand support because they tend to encourage unintended, dangerous uses.

CPSC **6.2.2.2-C** No specific requirement by CPSC.

CFA/CPSC **6.2.2.3-B** Any openings formed by handholds and structural components of the play equipment shall conform to the entrapment criteria (see Section 4.7.4).

6.2.3 DIAMETER OF HAND-GRIPPING COMPONENTS

CFA/CPSC **6.2.3.1-B** Handrails, handholds, rungs and other components intended to be grasped by the hands shall have a diameter or maximum cross-sectional dimension between 0.95 and 1.55 inches. To benefit the weakest children, a diameter of 1.25 inches for hand-gripping components is preferred.

Rationale: Requirements for the diameter of hand-gripping components are related to grip strength and hand size. Grip strength for the minimum user peaks at a diameter of about 1.25 inches, which also allows at least three-quarters of the smallest user's hand to enclose the component.

6.3 Platforms and Other Elevated Play Surfaces

6.3.1 GENERAL REQUIREMENTS

CFA/CPSC **6.3.1.1-B** Platforms shall be within ± 2 degrees of a horizontal plane.

CFA/CPSC **6.3.1.2-B** All transitional play surfaces, such as platforms, landings, walkways, and ramps, shall allow for proper drainage and prevent the accumulation of debris. Drainage holes shall preclude finger entrapment and pinching.

CFA **6.3.1.3-A** Structures with roofs shall be designed to minimize the likelihood of children climbing on top of them.

CPSC **6.3.1.3-C** No specific requirement by CPSC.

CFA **6.3.1.4-A** For platforms above 5 feet in height, a landing or intermediate standing surface shall be provided where children can make a decision not to continue their ascent and instead to pursue an alternate means of descent.

Rationale: Because the severity of fall injuries tends to increase with increasing height, it is important to given children options and forcing a child into a "no way out" situation on a high platform may increase the risk of a fall.

Note: CFA restricts the maximum height of platforms, climbing equipment, and slides to 6 feet for school-age children (see Section 4.1.5.3).

CPSC **6.3.1.4-C** Platforms over 6 feet in height (with the exception of free-standing slides) shall provide an intermediate standing surface where a decision can be made to halt the ascent and to pursue an alternate means of descent.

6.3.2 GUARDRAILS AND PROTECTIVE BARRIERS

Guardrails and protective barriers are an essential means of preventing injuries due to falls. Both guardrails and protective barriers are intended to prevent inadvertent falls off elevated play surfaces. Protective barriers, however, provide a greater degree of protection: in addition to preventing inadvertent falls over the edge, protective barriers are designed to prevent intentional attempts by children seeking to defeat the barrier.

6.3.2.1 General Requirements to Protect Against Falls from Elevated Surfaces

CFA/CPSC **6.3.2.1.1-B** Guardrails or protective barriers shall be provided on all elevated surfaces, such as platforms, walkways, landings, ramps, and other transitional play surfaces, in accordance with the following requirements. An elevated surface is exempt from these requirements if a guardrail or protective barrier would interfere with the intended use of the equipment; this includes most climbing components and platforms that are layered so that the fall height does not exceed 30 inches.

- Any elevated surface that is more than 30 inches above the protective surface shall have either a guardrail or protective barrier.
- Guardrails are acceptable for elevated surfaces over 30 inches but not over 48 inches high; however, full protective barriers always provide a greater protection against falls.
- Any elevated surface that is more than 48 inches above the protective surface shall have a full protective barrier.

Rationale: The degree of protection required depends on the height of the elevated surface in combination with the age of the intended users. The requirement for guardrails or protective barriers starting at a height of 30 inches is consistent with parallel requirements in the One and Two Family Dwelling Code (Section R215). In addition, because older children are at less risk of falls since their cognitive and motor skills are more advanced, protective barriers are not necessary at lower heights.

CFA/CPSC **6.3.2.1.2-B** All guardrails and protective barriers shall completely surround the elevated surface, except for the entrance and exit openings necessary for a play event.

CFA **6.3.2.1.3-A** All guardrails and protective barriers shall provide stationary, non-flexible protection against falls.

CPSC **6.3.2.1.3-C** No specific requirement by CPSC.

CFA/CPSC **6.3.2.1.4-B** All guardrails and protective barriers shall be designed to facilitate supervision.

CFA/CPSC **6.3.2.1.5-B** All guardrails and protective barriers shall minimize the likelihood of children climbing on or over them.

CFA/CPSC **6.3.2.1.6-B** Infill may be used to minimize the likelihood of climbing. However, horizontal cross-pieces shall not be used as infill below the top rail because

they can children a foothold for climbing. Vertical infill is preferable with regard to its lack of climbability and also because it can be grasped at any height for use as handholds. When solid infill is used, it is recommended that there be some transparent areas to facilitate supervision and to permit viewing of the platform.

6.3.2.2 Requirements for Guardrails

CFA/CPSC **6.3.2.2.1-B** The top surface of guardrails shall be at least 38 inches high and the lower edge of the guardrail shall not be more than 28 inches above the elevated surface.

Rationale: The minimum height of guardrails ensures that the standing center of gravity of the largest user is below the top edge, and thus provides protection against inadvertent falls over the guardrail. The standing center of gravity for a 95th percentile 12-year-old is 35.8 inches.

The maximum distance between the lower edge of the guardrail and the elevated surface ensures that the smallest user cannot inadvertently walk under the guardrail. This measurement corresponds to the chest height at axilla for a 5th percentile 5-year-old, which is 27.8 inches.

CFA/CPSC **6.3.2.2.2-B** Guardrails may have openings greater than 9 inches, but shall not have any openings between 3.5 and 9 inches to conform with entrapment criteria (see Section 4.7.4).

Rationale: Because guardrails are not intended to prevent intentional attempts to climb under or through them, they may have openings greater than 9 inches which would allow a child to pass through without being at risk of entrapment.

6.3.2.3 Requirements for Protective Barriers

CFA/CPSC **6.3.2.3.1-B** The top surface of protective barriers shall be at least 38 inches high.

Rationale: The minimum height of protective barriers ensures that the standing center of gravity of the largest user is below the top edge, and thus provides protection against inadvertent falls over the guardrail. The standing center of gravity for a 95th percentile 12-year-old is 35.8 inches.

CFA/CPSC **6.3.2.3.2-B** Protective barriers shall not have any openings greater than or equal to 3.5 inches within the barrier (i.e., between uprights) or between the lower edge of the barrier and the elevated surface to conform with entrapment criteria (see Section 4.7.4).

Rationale: Because protective barriers are designed to prevent children from climbing under or through them, all openings must be less than 3.5 inches so that children are not at risk of entrapment.

6.3.3 STEPPED PLATFORMS

On some composite structures, platforms may be layered or tiered so that falls from a higher platform are terminated by a lower platform rather than the ground surface. Stepped platforms are a good easy means of access/egress for younger children.

CFA/CPSC **6.3.3.1-B** The difference in height between stepped platforms shall not exceed 18 inches, unless an alternate means of access/egress is provided between the platforms.

Rationale: Because children typically climb up stepped platforms rather than step up, the vertical rise between stepped platforms may be somewhat greater than the smallest user's step height. The step height of a 5th percentile 5-year-old is 12.6 inches.

CFA/CPSC **6.3.3.2-B** All openings between stepped platforms shall conform to the entrapment criteria (see Section 4.7.4).

CFA/CPSC **6.3.3.3-B** When the height of the lower of two consecutive stepped platforms is greater than 48 inches above the protective surfacing, protective infill shall be provided in the space between the stepped platforms so that there are no openings greater than 3.5 inches.

Rationale: Because elevated surfaces above 48 inches in height require protective barriers, the space between stepped platforms should not allow children to pass through them, preventing falls as well as intentional jumps. To conform to entrapment criteria, this space, therefore, must not present any openings greater than 3.5 inches.

6.4 Slides

Slides may be straight, wavy, curved, or spiral and may provide either open bedways or tubes for descent. Although some free-standing slides are still available, slides are now commonly attached to composite structures. Alternatively, slide chutes can be built onto the grade of a natural or man-made slope; these are called embankment or hill slides.

Children can be expected to descend slides in many ways -- not just sitting, facing forward as intended by designers and manufacturers. Some will slide down backwards, on their knees, or lying on their back. Others will walk up and down the slide chute. Younger children are known to slide down on their stomachs, either head or feet first. These alternate sliding behaviors increase children's risk of injury. It should also be recognized that preschool-age children are the most frequent users of slides.

Because there is a high risk of falls at the top of slides and their accompanying access structures, designs which incorporate large platforms with multiple means of access/egress and adequate handholds for transitions contribute to the safer use of slides.

6.4.1 ACCESS TO SLIDES AND SLIDE PLATFORMS

CFA/CPSC **6.4.1.1-B** Climbing components and platforms which provide access to slides shall follow the general requirements in Section 6.1 and Section 6.3.1.

CFA/CPSC **6.4.1.2-B** Slide platforms shall be protected by guardrails or protective barriers in accordance with the requirements for elevated surfaces in Section 6.3.2.

CFA/CPSC **6.4.1.3-B** Slide platforms shall be at least 22 inches long.

Rationale: Platforms at the top of slides shall be long enough to accommodate children as they make the transition from a standing to a sliding position. The length of slide platforms corresponds to the buttock-to-knee measurement for a 95th percentile 12-year-old. The added protection of using an anthropometric value based on school-age children is warranted given the increased risk of falls for younger children.

CFA/CPSC **6.4.1.4-B** Slide platforms shall be at least as wide as the slide chute.

other openings, holes, protrusions or equipment components at the top of the slide or on the platform that may be catch points and cause entanglement incidents.

SAFETY ALERT: CPSC issued a warning about entanglement hazards (see Appendix A). Jackets and sweatshirts with hoods and/or drawstrings, ponchos, attached mittens, and scarves have been implicated in playground-related entanglement incidents that, in several cases, resulted in death by strangulation. Jewelry, such as necklaces and rings, has also been implicated in injuries from entanglement.

CFA/CPSC **6.4.2.2-B** The design and construction of the slide chute entrance shall channel the user into a seated position for sliding. This may be accomplished with a hood, guardrail, or other device; such means shall not encourage climbing or other dangerous uses.

CFA **6.4.2.3-A** A single horizontal bar or chain in front of the slide chute entrance is not recommended as a means to channel users into a seated position because children use such components in many hazardous ways.

CPSC **6.4.2.3-C** No specific requirement by CPSC.

CFA/CPSC **6.4.2.4-B** For embankment slides:

It is important that some means be provided at the slide chute entrance to minimize the likelihood that they will be used by children on skates, skateboards, or bicycles.

CFA/CPSC **6.4.2.5-B** Handholds or some other means of hand support shall be provided at the entrance to all slide chutes (except on tubes slides) to facilitate the transition from a standing to a sitting position for sliding and to decrease the risk of falls.

CFA/CPSC **6.4.2.6-B** The handholds or other means of hand support shall extend high enough to provide hand support for the largest child in a standing position and low enough to provide hand support for the smallest child in a sitting position.

CFA **6.4.2.7-A** The handholds or other means of hand support may be an integral part of the design feature which channels the user into a seated position.

CPSC **6.4.2.7-C** No specific requirement by CPSC.

CFA **6.4.2.8-A** The fall height of slides -- which is the height of the slide chute entrance -- shall not exceed 6 feet above the protective surfacing for school-age children, regardless of the type of slide.

Rationale: Limiting the fall height of slides is essential given the great risk of falls and related potential for serious injuries.

CPSC **6.4.2.8-C** No specific requirement by CPSC.

6.4.3 SLIDING SURFACE

CFA/CPSC **6.4.3.1-B** The average incline of the slide chute shall be no more than 30 degrees. This can be measured by determining that the height to length ratio does not exceed 0.577 (see Figure 6-2). No span on the sliding surface shall have a slope greater than 50 degrees.

The height of the slide shall be taken as the vertical distance between the slide chute entrance and exit. The length of the slide shall be taken as the horizontal distance between the slide chute entrance and exit.

CFA/CPSC **6.4.3.2-B** Any change in the slope of the sliding surface (e.g., wave slides) shall not allow a child to lose contact with the sliding surface.

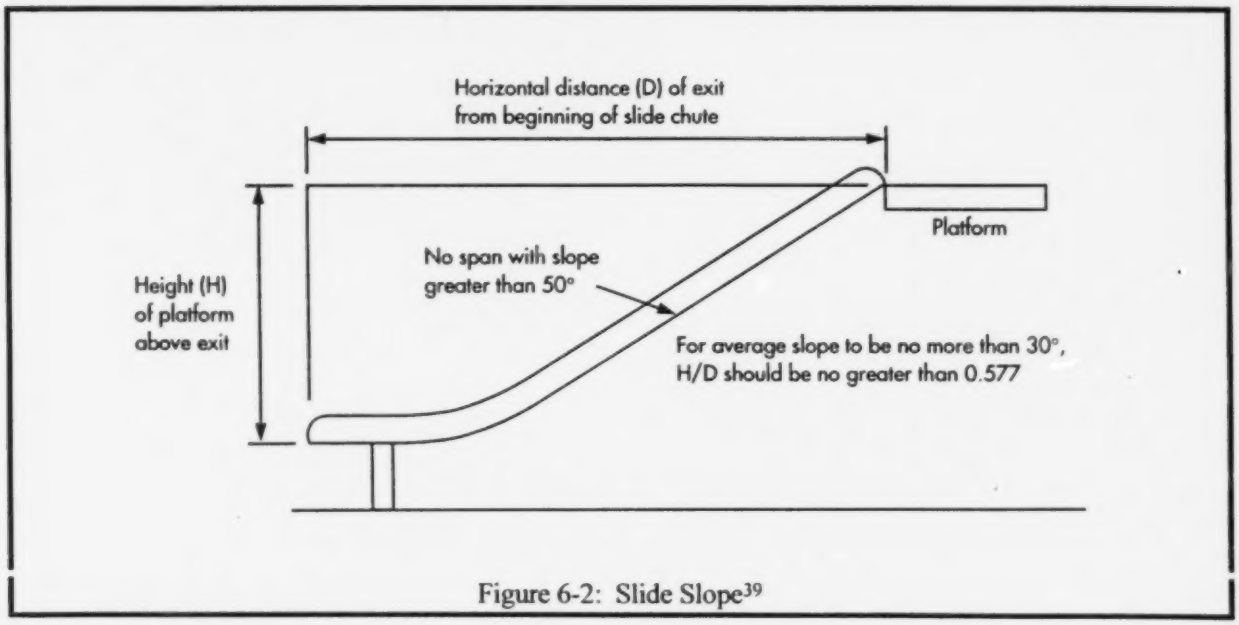

Horizontal distance (D) of exit
from beginning of slide chute
Platform
No span with slope
greater than 50°
Height (H)
of platform
above exit
For average slope to be no more than 30°,
H/D should be no greater than 0.577

Figure 6-2: Slide Slope[39]

[39] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety.*

CFA **6.4.3.3-A** The sliding surface shall have an inside width of at least 16 inches.

Rationale: The slide surface width is intended to accommodate the largest user, either in a seated position or lying down since both are anticipated uses. Because older children are less likely to slide down head first, however, it is acceptable for the slide width to be slightly less than the maximum user's shoulder breadth. The hip breadth and shoulder breadth of a 95th percentile 12-year-old are 13.1 inches and 15.7 inches, respectively.

CPSC **6.4.3.3-C** No specific requirement by CPSC.

CFA/CPSC **6.4.3.4-B** Slides with flat open chutes shall have sides at least 4 inches high extending along both sides for the entire length of the sliding surface. The sides shall be an integral part of the chute, without any gaps between the sides and the sliding surface (with the exception of roller slides).

CFA/CPSC **6.4.3.5-B** Slides may have an open chute with a circular, semi-circular, or curved cross-section provided that either the vertical height of the sides is at least 4 inches when measured at right angles to a horizontal line that is 16 inches wide inside the chute (see Figure 6-3) or the vertical height of the sides is no less than 4 inches minus two times the width of the slide chute divided by the radius of the slide chute curvature (see Figure 6-4).

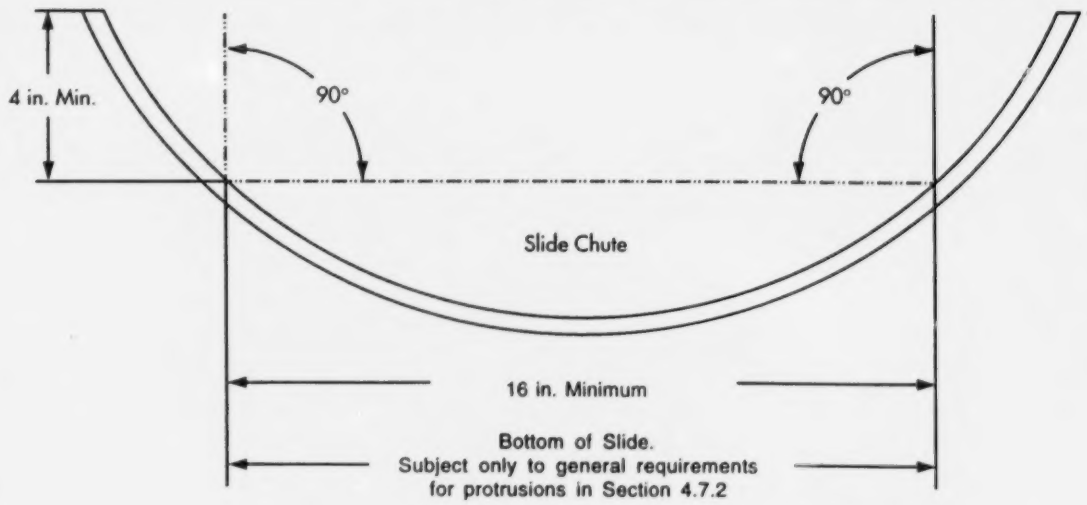
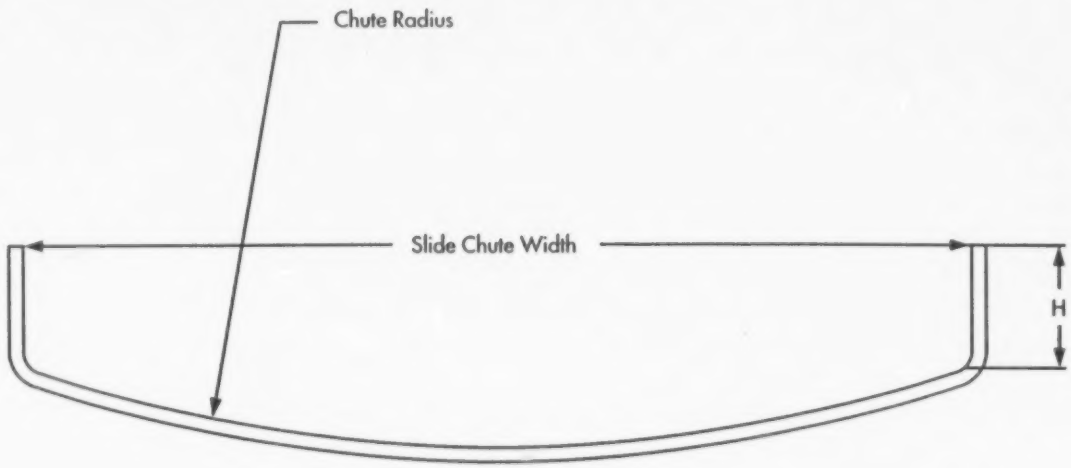


Figure 6-3: Minimum Side Height for Slides with Circular Cross-Section[40]

[40] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.



$$H = 4 - \frac{2 \times \text{Slide Chute Width}}{\text{Slide Chute Radius}}$$

Figure 6-4: Formula for Minimum Vertical Side Height for Slides with Curved Chute[41]

CFA	**6.4.3.6-A**	The sliding section shall not have any seams or joints which could cause entanglement incidents or in which hazardous debris may collect.
CPSC	**6.4.3.6-C**	No specific requirement by CPSC.
CFA/CPSC	**6.4.3.7-B**	Metal slides shall be located in shaded areas to prevent burns caused by direct sun on the slide chute (see Section 4.4.2.2).

SAFETY ALERT: CPSC issued a warning (see Appendix A) about metal equipment because of incidents in which children suffered second and third degree burns to their hands, legs, and buttocks when they sat on metal stairs, decks, or slides. Younger children are at most risk because, unlike older children who react quickly by pulling away their hands or getting off a hot surface, very young children may remain in place when they contact a hot surface.

[41] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA/CPSC **6.4.3.8-B** For tube slides:

Tube slides shall meet applicable requirements for other slides.

The minimum internal diameter of the tube shall be at least 23 inches.

Rationale: This minimum diameter is required to ensure that all intended users can slide through the tube unimpeded.

Either barriers shall be provided or surfaces shall be textured to prevent children from sliding on top (outside) of the tube.

It should be noted that children using tube slides may not be visible to a supervisor. Consideration should be given to having extra supervision on playgrounds with tube slides or to having transparent tube sections for visibility of children inside the slide.

CFA/CPSC **6.4.3.9-B** For roller slides:

Roller slides shall meet applicable requirements for other slides.

The space between adjacent rollers and between the ends of the rollers and the stationary structure shall be less than 3/16 inch.

Frequent inspections and maintenance are required to ensure that there are no broken or missing rollers.

CFA/CPSC **6.4.3.10-B** For embankment slides:

Embankment slides shall meet applicable requirements for other slides.

The slide chute of an embankment slide shall have a maximum height of 12 inches above the underlying ground surface. Such design basically eliminates the hazards of falls from height.

It is important that some means be provided at the slide chute entrance of embankment slides to minimize the likelihood that they will be used by children on skates, skateboards, or bicycles.

CFA/CPSC **6.4.3.11-B** For curved and spiral slides:

All applicable requirements for straight slides shall be adhered to, with special attention given to design features of curved or spiral slides which may present unique problems such as lateral discharge of the user.

Rationale: Curved and spiral slides offer a more complex motion than straight slides, requiring greater balance and postural control.

6.4.4 EXIT REGION

CFA/CPSC **6.4.4.1-B** The design of all slides shall incorporate an exit region as specified below.

Rationale: The exit region helps children maintain balance and facilitates a smooth transition from a sitting, sliding position to a standing, exiting position, thereby reducing the likelihood of falls and injuries at the lower end of slides.

CFA/CPSC **6.4.4.2-B** The exit region shall be essentially horizontal and parallel to the ground.

CFA/CPSC **6.4.4.3-B** The exit region shall be at least 11 inches long.

Rationale: The length of the exit region is correlated to the thigh length of the largest user. This dimension, which is the distance between tibiale and trochanter, for a 95th percentile 5-year-old is 11 inches.

CFA **6.4.4.4-A** The exit region shall be at least 9 inches but not more than 15 inches above the protective surfacing.

Rationale: The height of the exit region is correlated to the distance between the back of the knee and heel for the smallest and largest users. The tibial height, which is used to estimate this distance, is approximately 9 inches for a 5th percentile 5-year-old and 15 inches for a 95th percentile 12-year-old.

Note: The CFA requirement for the height of the exit region is based on anthropometric data and is , therefore, different for preschool-age and school-age children. The CPSC requirement for the height of the exit region is correlated to the height of the slide rather than the age of intended users.

CPSC **6.4.4.4-C** For slides that are no more than 4 feet in height, the height of the exit region shall be no more than 11 inches from the protective surface.

For slides over 4 feet in height, the exit region shall be at least 7 inches but no more than 15 inches above the protective surfacing.

CFA	**6.4.4.5-A**	The radius of curvature of the sliding surface in the exit region shall be at least 30 inches.
CPSC	**6.4.4.5-C**	No specific requirement by CPSC.
CFA/CPSC	**6.4.4.6-B**	Slide exit edges shall be rounded or curved in accordance with Section 4.7.1.
CFA/CPSC	**6.4.4.7-B**	Slide exits shall be located in uncongested sections of the play area.

6.5 Swings

Swings can be classified as either single or multiple axis swings. A single axis swing is intended to swing back and forth in a single plane and generally consists of a seat supported by at least two suspending members each of which is connected to separate pivot on an overhead support structure. To-fro swings, with either conventional belt-type or infant seats, are single axis swings. A multiple axis swing consists of a seat -- usually a tire suspended in a horizontal orientation -- supported by three suspending members each of which is connected to the same pivot on an overhead support structure allowing it to rotate and swing in any direction.

Children of all ages enjoy the sensations created by swinging. The intended use is for children to sit on swings, but younger children often swing on their stomachs and older children often swing kneeling or standing up. Older children may also jump off while swinging. Another unintended use of swings is that children twist the suspending members up, then let them unwind to spin around. All of these alternative uses increase the risk of injury.

6.5.1 GENERAL REQUIREMENTS

CFA/CPSC **6.5.1.1-B** The following types of swings shall not be included in public play areas, regardless of the age of intended users.

- Animal Swings
- Multiple Occupancy Swings such as Gliders (except Tire Swings)
- Swinging Exercise Rings and Trapeze Bars
- Rope Swings

Rationale: Animal swings are generally constructed of cast aluminum or molded plastic and painted to look like horses, zebras, ducks, other animals, rockets, cars, or other figures. They typically weigh between 30 and 80 pounds. Do not confuse animal swings with animal spring rockers, because the latter is not necessarily hazardous. Animal swings are hazardous because their weight and the likelihood of moving impact incidents.

SAFETY ALERT: CPSC issued a notice calling for the removal of all animal swings (see Appendix A). As of January 1995, two children had been killed by these swings and 42 children had suffered head injuries after being struck by them. The injuries included skull fractures, concussion and brain damage, serious lacerations and contusions, and one child who lost sight in one eye.

Multiple occupancy swings such as gliders generally consist of one or two benches that allow two or more children to sit and swing together. This kind of swing is more common on backyard-type than public play

equipment. Multiple occupancy swings such as gliders are hazardous because they are typically constructed of heavy, hard-hitting, rigid materials and, therefore, may cause serious head injuries in the event of an impact incident.

Swinging exercise rings are typically a pair of rings about 6-7 inches in diameter each hanging on a chain from an overhead beam so that they can swing freely. A trapeze bar is typically a metal bar about 2 feet in length suspended from each end by a chain that it can swing freely. These are intended more for gymnastics and fitness activities, although they are still found on some older swing structures on playgrounds. Swinging exercise rings or trapeze bars are hazardous because they are typically constructed of heavy, hard-hitting, rigid materials and, therefore, may cause serious head injuries in the event of an impact incident. Note: this specification does not apply to overhead hanging rings such as those on a ring trek or ring ladder; there is a maximum chain length of 12 inches for this kind of overhead rings (see Section 6.1.11.3).

Rope swings generally consist of a long, thick rope suspended vertically from an overhead beam. Sometimes there are large knots tied in the rope to provide foot and hand holds. Alternatively, they may be a small round seat mounted on the rope. A free swinging rope presents a significant risk of injury caused by moving impact incidents, particularly because children have less control of a free swinging rope than they do of a conventional swing. In addition, a free swinging may be looped back on itself and form a noose. Braided or twisted ropes have also been known to fray or become loose and thus present entanglement and strangulation hazards.

6.5.2 SINGLE-AXIS SWINGS

6.5.2.1 Swing Seats

CFA/CPSC **6.5.2.1.1-B** Swing seats shall not be constructed of wood, metal, or other hard, heavy, rigid materials.

Rationale: Using lightweight, impact-absorbing materials for swing seats helps reduce the severity of injuries if impact incidents occur. Heavy, rigid swing seats may cause serious impact injuries.

CFA/CPSC **6.5.2.1.2-B** All swing seats shall be made of lightweight materials such as rubber or plastic.

CFA **6.5.2.1.3-A** For strength, durability, and safety, flexible strap-type seats constructed either of molded rubber with a steel insert or high-density polyethylene are recommended.

CPSC **6.5.2.1.3-C** No specific requirement by CPSC.

CFA/CPSC **6.5.2.1.4-B** The edges of all swing seats shall be smoothly finished or have rounded edges and shall conform the requirements for protrusions on suspended members of swing assemblies described in Section 4.7.2.8.

CFA/CPSC **6.5.2.1.5-B** All seats for single-axis swings shall be designed to accommodate only one user at a time.

CFA/CPSC **6.5.2.1.6-B** The seat height measured from the underside of an occupied swing shall be no less than 16 inches above the protective surfacing (see Figure 6-5). NOTE: If loose-fill material is used as a protective surfacing, the seat height should be determined after the material has been leveled.

Rationale: Swings should be suspended at a height which allows the smallest children to seat themselves comfortably without being so low that the largest children's feet will consistently hit the ground while swinging. The height of 16 inches accommodates the buttock height of a 5th percentile 5-year-old (gluteal furrow height is 16.0 inches) as well as the approximate seated height of a 95th percentile 12-year-old (tibiale height, which is the distance from the heel to the back of the knee, is 17.6 inches). Note that values greater than this minimum will make it increasingly difficult for younger children in this age group to mount the swing.

6.5.2.2 Swing Support Structures

CFA/CPSC **6.5.2.2.1-B** Single-axis swings shall not be attached to composite structures.

Rationale: Given the risk of life-threatening head injuries if a moving impact incident occurs, it is important that swings be installed only on independent structures and located away from all other equipment. Moreover, composite play structures tend to attract crowds of children playing at a fast pace, which reduces their attention level to peripheral stimuli thus increasing the risk of a moving impact incident.

CFA/CPSC **6.5.2.2.2-B** Swing support structures shall be designed to minimize the likelihood of children climbing on them. Support structures shall, therefore, not use

horizontal cross-bars, other than the top cross-beam from which the swings are suspended.

CFA/CPSC **6.5.2.2.3-B** Swing hangers for single-axis swings shall spaced no less than 20 inches apart (see Figure 6-5).

Rationale: Hanging swings in this manner helps reduce side-to-side movement and, therefore, the potential for impact incidents.

CFA **6.5.2.2.4-A** All swing hangers shall be commercial grade and designed to reduce wear.

CPSC **6.5.2.2.4-C** No specific requirement by CPSC.

CFA/CPSC **6.5.2.2.5-B** Swing hangers shall be designed to prevent any pinch, crush, or shearing hazards.

CFA/CPSC **6.5.2.2.6-B** Connecting links such as "S" hooks, "C" hooks, or "Pelican" hooks shall be pinched closed as tightly as possible and shall not present any entanglement hazards. A hook is considered closed if there is no gap or space greater than 0.04 inches. It is appropriate to measure the gap with a feeler gauge but, in the absence of such a gauge, the gap should not admit a dime.

CFA/CPSC **6.5.2.2.7-B** Fiber ropes shall not be used to suspend swings.

CFA/CPSC **6.5.2.3.8-B** The following clearances shall be provided up to a height of 60 inches above the protective surfacing for single-axis swings and swing structures (see Figure 6-5):

- The horizontal distance between adjacent swings shall be at least 24 inches.
- The horizontal distance between a seat and an adjacent structural component shall be at least 30 inches.

Rationale: The 24-inch minimum clearance required between adjacent swings accommodates the shoulder breadth of a 95th percentile 12-year-old (16 inches) with some tolerance on each side; at the same time this distance is not so large as to encourage children to run between swings.

The minimum clearance required between a swing and an adjacent structural component is greater to provide extra protection against injuries caused by impact with a rigid structure.

These minimum clearances shall be satisfied up to a height of 60 inches to accommodate the stature of a 95th percentile 12-year-old, since older children are likely to stand on swings.

CFA **6.5.2.2.9-A** The fall height of single-axis swings -- which is the height of the pivot point -- shall not exceed 8 feet above the protective surfacing..

CPSC **6.5.2.2.9-C** No specific requirement by CPSC.

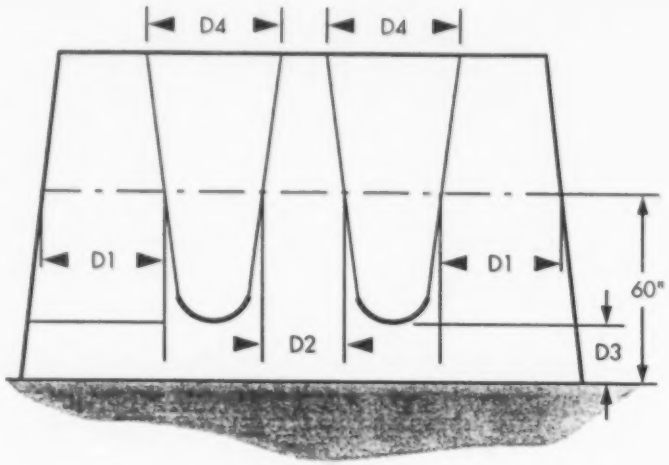
CFA/CPSC **6.5.2.2.10-B** No more than two single-axis swing seats shall be suspended within each bay of a swing support structure.

Rationale: Limiting the swing structures to two seats per bay helps reduce the likelihood of children getting hit by a moving swing. When there are more than two swings per bay, children swinging on a middle swing(s) is at increased risk of a collision from one or both sides. In addition, children do not always swing straight, and their play patterns often cause the swings to move out of the usual to-fro axis (e.g., twisting the swing then letting it unwind, jumping off without stopping the swing's motion).

CFA/CPSC **6.5.2.2.11-B** Swing structures shall be located away from other equipment and activities.

Greater protection against impact injuries can be provided by means of a low barrier at the edge of the buffer zone, such as a fence or hedge, to separate swings from other equipment. Such barriers, however, must not be an obstacle in the fall zone or hamper supervision by blocking visibility.

Rationale: Locating swings away from other equipment and activities, preferably in a corner of the play area, is an essential means of preventing impact injuries caused by children inadvertently running into the path of a moving swing.



D1 = 30" minimum

D2 = 24" minimum

D3 = 16" minimum

D4 = 20" minimum

Figure 6-5: Minimum Clearances for Single-Axis Swings[42]

[42] This Figure is an adaptation of a Figure in the CPSC *Handbook for Public Playground Safety*.

6.5.3 MULTI-AXIS SWINGS

6.5.3.1 Tire Swings

CFA/CPSC	**6.5.3.1.1-B**	Heavy truck tires shall be avoided to minimize the hazard of impact. If steel-belted radials are used, they shall be examined closely to ensure that there are no exposed steel belts which could cause laceration or puncture injuries. Plastic materials can be used as an alternative to simulate actual tires.
CFA/CPSC	**6.5.3.1.2-B**	Tires shall allow for proper drainage. Drainage holes shall preclude finger entrapment and pinching.
CFA	**6.5.3.1.3-A**	The lower edge of the tire shall be at least 12 inches but not more than 18 inches above the protective surfacing.
CPSC	**6.5.3.1.3-C**	No specific requirement by CPSC.

6.5.3.2 Tire Swing Support Structures

CFA/CPSC	**6.5.3.2.1-B**	Tire swings shall not be attached to composite structures. *Rationale: Given the risk of life-threatening head injuries if a moving impact incident occurs, it is important to locate swings away from all other equipment. Moreover, composite play structures tend to attract crowds of children playing at a fast pace, which reduces their attention level to peripheral stimuli thus increasing the risk of a moving impact incident.*
CFA/CPSC	**6.5.3.2.2-B**	Tire swing support structures shall be designed to minimize the likelihood of children climbing on them. Support structures shall, therefore, not use horizontal cross-bars, other than the top cross-beam from which the swings are suspended.
CFA	**6.5.3.2.3-A**	Tire swivels, shall be commercial grade and designed to reduce wear.
CPSC	**6.5.3.2.3-C**	No specific requirement by CPSC.
CFA/CPSC	**6.5.3.2.4-B**	Tire swivels shall be designed to prevent any pinch, crush, or shearing hazards.

CFA/CPSC	**6.5.3.2.5-B**	Connecting links such as "S" hooks, "C" hooks, or "Pelican" hooks shall be pinched closed as tightly as possible and shall not present any entanglement hazards. A hook is considered closed if there is no gap or space greater than 0.04 inches. It is appropriate to measure the gap with a feeler gauge but, in the absence of such a gauge, the gap should not admit a dime.
CFA/CPSC	**6.5.3.2.6-B**	Fiber ropes shall not be used to suspend swings.
CFA/CPSC	**6.5.3.2.7-B**	When the tire is held in a position closest to the support structure, the horizontal distance between the seat surface of the tire and the adjacent upright of the support structure shall be at least 30 inches (see Figure 6-6). *Rationale: This clearance is required to provide adequate space for children to reach out with their arms and legs or to lean back while sitting on the tire without impacting support structures.*
CFA	**6.5.3.2.8-A**	The fall height of tire swings -- which is the height of the pivot point -- shall not exceed 8 feet above the protective surfacing.
CPSC	**6.5.3.2.8-C**	No specific requirement by CPSC.
CFA/CPSC	**6.5.3.2.9-B**	A multi-axis tire swing shall not be suspended from a structure having any other swings in the same bay.
CFA	**6.5.3.2.10-A**	Only one tire swing shall be suspended within a single bay.
CPSC	**6.5.3.2.10-C**	No specific requirement by CPSC.
CFA/CPSC	**6.5.3.2.11-B**	Swing structures shall be located away from other equipment and activities. Greater protection against impact injuries can be provided by means of a low barrier at the edge of the buffer zone, such as a fence or hedge, to separate swings from other equipment. Such barriers, however, must not be an obstacle in the fall zone or hamper supervision by blocking visibility. *Rationale: Locating swings away from other equipment and activities, preferably in a corner of the play area, is an essential means of preventing impact injuries caused by children inadvertently running into the path of a moving swing.*

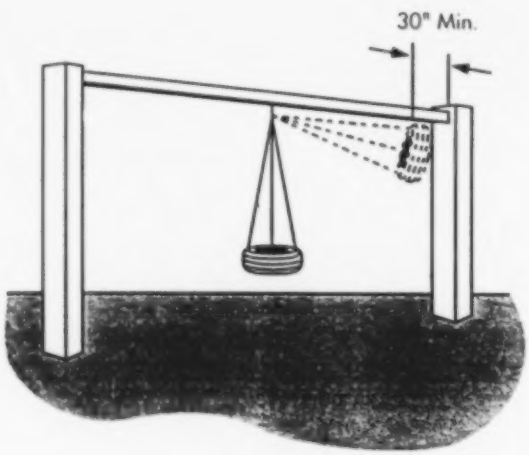


Figure 6-6: Minimum Clearance for Tire Swings[43]

[43] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

6.6 Rotating Equipment

6.6.1 SWINGING GATES

A rotating/swinging gate is a gate mounted on a single post that swings around the post, generally with a complete 360 degree rotation. Often the gate is a simple frame with vertical rails. Children stand on the gate as it rotates, as an alternative to more traditional merry-go-rounds.

CFA **6.6.1.1-A** Swinging, rotating gates shall not be included in public play areas, regardless of the age of intended users.

Rationale: Rotating/swinging gates present a high risk of fall and impact injuries. Younger children do not attend as well to peripheral stimuli or understand fully cause and effect, both of which increase the likelihood of moving impact incidents. Older children are likely to misuse this kind of rotating equipment, with an emphasis on making the gate rotate as fast as possible. Because these gates typically do not have any means to limit their speed, it is easy to create a hazardous situation with the rigid, heavy gate. In addition, the rotation and connection points of the gate to its support post may present serious pinch or crush hazards.

CPSC **6.6.1.1-C** No specific requirement by CPSC.

6.6.2 LOG ROLLS

CFA **6.6.2.1-A** Hand support consisting of a handhold on either side of the log roll shall be provided. However, a single horizontal bar shall not be used as a means of hand support above a log roll.

CPSC **6.6.2.1-C** No specific requirement by CPSC.

CFA **6.6.2.2-A** Log rolls shall be located away from other play events, preferably at the edge of the play area.

Rationale: Because of the increased risk of injuries associated with moving equipment, it should be separated from other equipment.

CPSC **6.6.2.2-C** No specific requirement by CPSC.

CFA	**6.6.2.3-A**	The fall height of log rolls -- which is the top of the rotating log or barrel -- shall not exceed 2 feet above the protective surfacing.
CPSC	**6.6.2.3-C**	No specific requirement by CPSC.
CFA	**6.6.2.4-A**	Given the hazardous nature of log or barrel rolls and the tendency for misuse of this equipment, it is recommended that they be included only in play areas where there is constant adult supervision.
CPSC	**6.6.2.4-C**	No specific requirement by CPSC.

6.6.3 MERRY-GO-ROUNDS

Merry-go-rounds are a common type of rotating equipment. Most merry-go-rounds consist of a circular base, close to the ground, which children either sit or stand on and that rotates when pushed. Some merry-go-rounds designed for younger children are a concave, dish-like platform in which children sit.

CFA/CPSC	**6.6.3.1-B**	The rotating base of all merry-go-rounds shall be continuous and approximately circular.
CFA/CPSC	**6.6.3.2-B**	The difference between the minimum and maximum radii of a non-circular base shall not exceed 2 inches (see Figure 6-7).

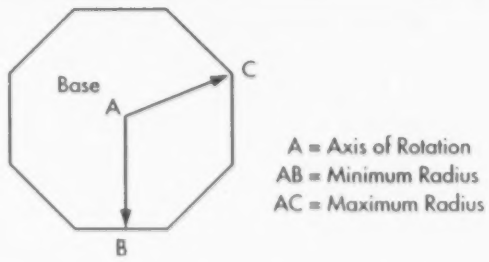


Figure 6-7: Minimum and Maximum Radii of Non-circular Merry-go-Round Platforms[44]

[44] This Figure is reprinted from the CPSC *Handbook for Public Playground Safety*.

CFA/CPSC	**6.6.3.3-B**	There shall not be any accessible shearing or crushing mechanisms in the undercarriage of the equipment.
CFA	**6.6.3.4-A**	The rotating base shall be solid and preclude access to the undercarriage and rotating mechanism of the merry-go-round. *Rationale: The undercarriage and rotating mechanism of merry-go-rounds should be totally enclosed to eliminate all potential pinch, crush, and shearing hazards.*
CPSC	**6.6.3.4-C**	The surface of the platform shall be continuous with no openings between the axis and the periphery that permit a rod having a diameter of 5/16-inch to penetrate completely through the surface.
CFA	**6.6.3.5-A**	The diameter of the rotating base shall not exceed 8 feet. *Rationale: One means of reducing the frequency and severity of injuries associated with merry-go-rounds is to limit the size of their rotating base.*
CPSC	**6.6.3.5-C**	No specific requirement by CPSC.
CFA/CPSC	**6.6.3.6-B**	The rotating base shall not have any sharp edges.
CFA/CPSC	**6.6.3.7-B**	Nothing shall protrude beyond the outer edge of the rotating base.
CFA/CPSC	**6.6.3.8-B**	All merry-go-rounds, with or without seats, shall provide a means of hand support.
CFA/CPSC	**6.6.3.9-B**	Handrails or handgrips provided on merry-go-rounds shall conform to the general requirements for the diameter of hand-gripping components (see Section 6.2.3) as well as to all protrusion requirements (see Section 4.7.2.7).
CFA/CPSC	**6.6.3.10-B**	Merry-go-rounds shall not be equipped with an oscillatory (up and down) motion.
CFA/CPSC	**6.6.3.11-B**	A means shall be provided to limit the peripheral speed of rotation to a maximum of 13 ft./sec.

CFA/CPSC	**6.6.3.12-B**	The underside of the perimeter of the rotating platform shall be no less than 9 inches above the level of the protective surfacing.
CFA	**6.6.3.13-A**	The standing surface of merry-go-rounds shall no more than 1 foot above the protective surfacing. When seats are provided on merry-go-rounds, the height of the seats shall be no more than 2 feet above the protective surfacing.
CPSC	**6.6.3.13-C**	No specific requirement by CPSC.
CFA/CPSC	**6.6.3.14-B**	Merry-go-rounds shall be located away from other play events, preferably at the edge of the play area. *Rationale: Because of the increased risk of injuries associated with moving equipment, it should be separated from other equipment.*
CFA	**6.6.3.15-A**	Given the tendency for older children to use merry-go-rounds in unintended and dangerous ways, it is recommended that merry-go-rounds be included only in play areas where there is constant adult supervision.
CPSC	**6.6.3.15-C**	No specific requirement by CPSC.

6.7 Seesaws

Traditional seesaws consist of a board or pole with a seat at each end, supported at the center by a fulcrum.

Given a lack of control and unpredictability, there are inherent hazards in the design of traditional fulcrum seesaws -- especially for preschool-age children -- because safe use depends on the cooperative and complementary behavior of two children.

Spring-loaded seesaws are now available, offering children a much safer alternative. In these designs, the center of the seesaw has a spring base which prevents either end from hitting the ground should one child decide to dismount but still provides a similar up-and-down motion. The spring mechanism helps reduce the risk of impact injuries due to abrupt contact with the ground. Some spring-loaded seesaws have two seats, and others have four.

6.7.1 TRADITIONAL FULCRUM SEESAWS

CFA/CPSC **6.7.1.1-B** The fulcrum of seesaws shall not present any pinch or crush hazards.

CFA/CPSC **6.7.1.2-B** Tires, or some other shock-absorbing material, shall be embedded in the protective surfacing below the seats, on both ends, of traditional fulcrum seesaws, or be secured on the underside of both seats.

Rationale: This design technique helps cushion the impact when one end of the seesaw hits the ground and also helps protect against limbs being crushed between the seat and the ground.

CFA/CPSC **6.7.1.3-B** Handholds shall be provided for each seat position on traditional fulcrum seesaws and shall not extend beyond the width of the seesaw. In addition, all handholds shall conform to protrusion requirements (see Section 4.7.2.7) and the general requirements for the diameter of hand-gripping components (see Section 6.2.3).

CFA/CPSC **6.7.1.4-B** Footrests shall not be provided on traditional fulcrum seesaws.

CFA **6.7.1.5-A** The distance between adjacent seesaws on the same support structure shall be at least 36 inches.

Rationale: This requirement is intended to prevent potentially hazardous interaction between children on adjacent seesaws and is based on the arm reaches of anticipated users.

CPSC **6.7.1.5-C** No specific requirement by CPSC.

CFA/CPSC **6.7.1.6-B** Fulcrum seesaws shall be constructed so that the maximum attainable angle between a line connecting the seats and the horizontal is 25 degrees.

CFA **6.7.1.7-A** The fall height -- which is the highest attainable position of the seats -- shall not exceed 4 feet above the protective surfacing.

Rationale: Because children may experience an uncontrollable drop to the ground during seesaw use, it is essential to limit the height of these potential drops.

CPSC **6.7.1.7-C** No specific requirement by CPSC.

CFA **6.7.1.8-A** Because of the high risk of impact injuries and the tendency for misuse of traditional fulcrum seesaws, it is recommended that they be included only in play areas where there is constant adult supervision.

CPSC **6.7.1.8-C** No specific requirement by CPSC.

6.7.2 SPRING-LOADED SEESAWS

CFA/CPSC **6.7.2.1-B** It is recommended that spring-loaded seesaws be substituted for traditional fulcrum seesaws to minimize the risk of impact injuries.

CFA **6.7.2.2-A** Spring-loaded seesaws shall follow the requirements of Section 6.8.1 and Section 6.8.2.

CPSC **6.7.2.2-C** No specific requirement by CPSC.

6.8 Spring Rocking Equipment

Spring rocking equipment may be in the form of individual seat assemblies mounted on a spring mechanism or consist of several seat assemblies linked by a common spring mechanism (i.e., a spring-loaded seesaw).

Although very young children enjoy and benefit developmentally from individual spring rockers, this equipment typically does not present enough challenge to interest older children. Older preschoolers may prefer spring-loaded seesaws. And school-age children tend to prefer spring platforms.

6.8.1 SPRINGS

CFA/CPSC **6.8.1.1-B** The spring mechanism of rocking equipment shall minimize the possibility of children pinching either their hands or feet between coils of the spring or between the spring and part of the rocker.

6.8.2 SEAT ASSEMBLIES

The requirements for seat assemblies apply to individual spring rockers as well as spring-loaded seesaws.

CFA/CPSC **6.8.2.1-B** Seat design shall not allow the rocker to be used by more than the intended number of children at one time

CFA/CPSC **6.8.2.2-B** Handholds shall be provided for each seat position on spring rocking equipment and shall conform to the general requirements for the diameter of hand-gripping components (see Section 6.2.3) as well as to all protrusion requirements (see Section 4.7.2.7).

CFA/CPSC **6.8.2.3-B** Footrests shall be provided for each seat position on spring rocking equipment and shall conform to all protrusion requirements (see Section 4.7.2.7).

CFA/CPSC **6.8.2.4-A** There shall be a minimum distance of 36 inches between independent spring rockers or between adjacent seat assemblies on spring rocking equipment such as a four-way spring-loaded seesaw. This minimum

clearance does not apply when an independent spring rocker has a single seat assembly designed for more than one user to sit together.

Rationale: This requirement is intended to prevent potentially hazardous interaction between children on adjacent seat assemblies of spring rocking equipment.

CPSC **6.8.2.4-C** No specific requirement by CPSC.

CFA/CPSC **6.8.2.5-A** Seat assemblies of rocking equipment shall be no higher than 24 inches above the protective surfacing when at rest and unoccupied.

Rationale: This maximum height is intended to limit potential fall heights while accommodating the waist height of the largest user, assuming that 5-year-olds are the typically the oldest users of spring rockers. The waist height of a 95th percentile 5-year-old is 26.3. Since children actively climb up onto the equipment, this 24-inch height is also reasonable from the standpoint of smaller, younger users.

CPSC **6.8.2.5-C** No specific requirement by CPSC.

6.8.3 SPRING PLATFORMS

CFA **6.8.3.1-A** The standing surface of spring platforms shall not be higher than 18 inches above the protective surfacing.

Rationale: It is important to limit the height of spring platforms given the potential for falls.

CPSC **6.8.3.1-C** No specific requirement by CPSC.

Section 7

COMPLIANCE WITH THE AMERICANS WITH DISABILITIES ACT

The Law

The Americans with Disabilities Act of 1990 is a public law (P.L. 101-336) that provides protection for 43 million individuals against discrimination on the basis of impairment. The ADA is a comprehensive civil rights law mandating that public spaces be accessible to disabled persons.

The ADA applies to outdoor public play areas, so playgrounds should be made accessible to all children regardless of ability. Owners, operators, and designers of play areas and equipment must consider the impact of the ADA and address any other Federal, State, and Local requirements which govern their playgrounds. All new playgrounds should be designed in compliance with ADA requirements, and consideration should be given to renovating existing playgrounds accordingly.

The spirit of the law is a call for integration and the removal of barriers -- physical and otherwise -- which foster prejudice. The law requires public facilities and programs, including employers, to provide "the most integrated setting appropriate for the needs of the individual." With respect to children, this goal runs parallel to the basic tenets of developmentally appropriate early childhood practices.

The key to implementing the ADA as intended and in its true spirit is to view the requirements as an opportunity to improve play and learning for all children, rather than as a burden.

Accessible Play Opportunities

All children have an equal right to play, and all children should be able to play together. Outdoor play environments must, therefore, offer accessible play opportunities. Integration and a meaningful program of play in physically accessible areas are essential. Access to outdoor play opportunities that are not near where others are playing is not helpful. Separate is not equal! Further, access is not helpful unless the physically accessible play opportunities are developmentally relevant.

The best approach is to provide a wide variety of play opportunities across a range of challenge that address development in all domains and are usable by children with varied abilities. Increasing developmental appropriateness is an effective way to increase accessibility while improving play value for all children. The outdoor environment should support social, constructive, and pretend forms of play along with active play. A playground limited to active play opportunities does not meet the needs of any child.

Accessible Active Play Structures

"The most significant aspect of making a piece of play equipment accessible is to understand that children with disabilities need many of the same challenges as children without disabilities." (Source: *Play For All Guidelines*, Moore, Goltsman, and Iacofano, 1992).

When designing for or evaluating the accessibility of an active play structure, consider the following elements.

- Path of travel
- Synthetic surfaces
- Transfer stations
- Parking places (for wheelchairs adjacent to the transfer point)
- Stepped decks (8" vertical rise)
- Large decks
- Handholds
- Play panels (on decks and/or at ground level)
- Ground exit slides
- Ramps with anti-roll edges
- Landscape features such as hills and overlooks to provide sensations of height

Special consideration needs to be given to the use of ramps. While ramps can provide access for wheelchair users to the play structure, they can also create many safety problems. For example, children are known to ride bicycles and skateboards up and down ramps, which is a obvious danger to themselves and others. The idea of wheelchairs up on elevated decks is also inherently dangerous, according to many safety advocates. Furthermore, the financial feasibility of ramps is an issue. Ramps are very expensive relative to other accessible play events. In addition, because of the large space they require, their fall zones are much larger and, therefore, more costly. Although ramps can be used safely and appropriately in certain controlled settings, it is recommended that the minimal play value of ramps be evaluated against their potential safety hazards and high cost before widespread use.

Design Guidelines for Accessibility

The CPSC handbook does not address specific design guidelines related to accessibility, but the ASTM standard for public playground equipment (F1487) does. The ASTM standard addresses accessible paths of travel, ramps intended for wheelchair use, landings, transfer points, accessible stepped platforms, and other accessible play opportunities.

The Federal government is expected to publish its own design guidelines for accessible playgrounds and other outdoor facilities. The Architectural and Transportation Barriers Compliance Board (Access Board) convened a Federal Recreation Access Advisory Committee in 1993 to begin developing these accessibility guidelines. The Committee published a report in 1994, *Recommendations for Accessibility Guidelines: Recreational Facilities and Outdoor Developed Areas*, which includes a section on playgrounds. It must be recognized, however, that these recommendations are neither final nor enforceable. Nevertheless, it is recommended that all playground owners, operators, and designers familiarize themselves with this report.

The Access Board report includes a policy on play area access and play setting recommendations for new construction in the following sections: most integrated setting; accessible route of travel within a play setting; play equipment access; equipment and play components on the ground plane; equipment and activities elevated above the surface for both large and small composite play structures; swings; water play; sand play areas; gathering places; garden settings; vegetation, tress, and topography; soft contained play systems; entrances; signage; chemical maintenance of the play area; safety and access; and, consultation and documentation.

Section 8

REFERENCES

American Society for Testing and Materials. (1995). *Standard Consumer Safety Performance Specification for Playground Equipment for Public Use: ASTM F1487-95.* Philadelphia, PA: American Society for Testing and Materials.

American Society for Testing and Materials. (1993). *Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment: ASTM F1292-93.* Philadelphia, PA: American Society for Testing and Materials.

Blumberg, P. (1995, May 22). *Play Goes Out of Playground: City Pulls Unsafe Equipment; New Pieces due this August.* Anchorage Daily News.

Bond, M. T. & Peck, M. G. (1993). "The Risk of Childhood Injury on Boston's Playground Equipment." *American Journal of Public Health*, 83(5) pp. 731-733

Bredekamp, S. (Ed.) (1987). *Developmentally Appropriate Practice in Early Childhood Programs Serving Children from Birth through Age Eight.* Washington, DC: National Association for the Education of Young Children.

Briss, P., Sacks, J., Addiss, D., Krensnow, M. & O'Neil, J. (1995). *Injuries from Falls on Playgrounds: Effects of Day Care Center Regulation and Enforcement.* Arch Pediatr Adolesc Med; 149: 906-911.

Caesar, B. & DeFrancesco, S. (1995). *Playground Safety Regulation in the U.S.: A Discussion of the Issues.* Baltimore, MD: Injury Prevention Works.

Christiansen, M. (Ed.) (1992). *Play it Safe: An Anthology of Playground Safety.* Arlington, VA: National Recreation and Park Association.

Collantes, M. (1990). *Playground Surfaces and Head Injury: Evaluation of the Importance of Using the Head Injury Criterion (Hic) to Estimate the Likelihood of Head Impact Injury as a Result of a Fall onto Playground Surface Material.* Washington, DC: U.S. Consumer Product Safety Commission.

Dodge, D. T. & Colker, L. J. (1992). *The Creative Curriculum For Early Childhood, Third Edition.* Maryland: Gryphon House.

Frost, J. L. (1992). *Play and Playscapes.* Albany, NY: Delmar Publishers.

Kutska, K. & Hoffman, K. (1992). *Playground Safety is No Accident: Developing a Comprehensive Public Playground Safety and Maintenance Program.* Arlington, VA: National Recreation and Park Association.

McIntyre, S., Goltsman, S. (1995). *Safety First Checklist, Second Edition.* Berkeley, CA: MIG Communications.

Mierzwinski, E., Fise, M. E. & Morrison, M. (1996). *Playing it Safe: A Third Nationwide Safety Survey of Public Playgrounds.* Washington, DC: U. S. Public Interest Research Group (PIRG) and Consumer Federation of America (CFA).

Mierzwinski, E., Fise, M. E. & Morrison, M. (1998). *Playing it Safe: A Fourth Nationwide Safety Survey of Public Playgrounds.* Washington, DC: U. S. Public Interest Research Group (PIRG) and Consumer Federation of America (CFA).

Moore, R. C., Goltsman, S. M., & Iacofano, D. S. (1992). *Play For All Guidelines: Planning, Design, and Management of Outdoor Play Settings for All Children, Second Edition.* Berkeley, CA: MIG Communications.

Moore, R. C. (1993). *Plants for Play.* Berkeley, CA: MIG Communications.

Morrison, M. (1995). *A Human Factors Approach to Design.* Silver Spring, MD: Children First of Maryland, Inc.

Morrison, M. (1993). "Playgrounds." In *Parks and Recreation Facilities Guidelines*. Prince George's County, MD: Maryland-National Capital Park and Planning Commission.

Morrison, M. & DeFrancesco, S. (1993). *Evaluating and Improving Playground Safety: A Playground Inventory and Assessment System.* Baltimore, MD: Injury Prevention Works.

Morrison, M. & DeFrancesco, S. (1993). *Surveying Playground Safety: An Advocate's Guide.* Baltimore, MD: Injury Prevention Works.

Owings, C. L., Norcutt, R. H., Snyder, R. G., Golomb, D. H. & Lloyd, K. Y. (1977).. *Gripping Strength Measurements of Children for Product Safety Design.* Ann Arbor, MI: Univ. of Michigan.

New York State Department of Health Injury Control Program. *Injury Prevention: Playgrounds.* New York, NY: New York State Department of Health.

Ramsey, L. F. & Preston, J. F. (1990). *Impact Attenuation Performance of Playground Surfacing Materials.* Washington, DC: U.S. Consumer Product Safety Commission.

Ratté, D., Morrison, M., & Lerner, N. (1990). *Development of Human Factors Criteria for Playground Equipment Safety.* Final Report on Contract CPSC-C-88-1231, submitted by Comsis Corporation to the U.S. Consumer Product Safety Commission.

Schneider, L. W., Lehman, R. J., Pflug, M. A., & Owings, C. L. (1986). *Size and Shape of the Head and Neck from Birth to Four Years.* Ann Arbor, MI: Univ. of Michigan., Transportation Research Institute, Institute of Science and Technology.

Sikes, L., Fise, M. E. & Morrison, M. (1992). *Playing it Safe: A Nationwide Safety Survey of Public Playgrounds.* Washington, DC: U. S. PIRG and CFA.

Synder, R. G., Schneider, L. W., Owings, C. L., Reynolds, H. M., Golomb, D. H. & Schork, M. A. (1977). *Anthropometry of Infants, Children, and Youths to Age 18 for Product Safety Design*. Ann Arbor, MI: Univ. of Michigan., Highway Safety Research Institute.

Synder, R. G., Spencer, M. L., Owings, C. L. & Schneider, L. W. (1975). *Physical Characteristics of Children as Related to Death and Injury for Consumer Product Safety Design*. Ann Arbor, MI: Univ. of Michigan., Highway Safety Research Institute.

Tinsworth, D. K. & Kramer, J. T. (1990). *Playground Equipment-Related Injuries and Deaths*. Washington, DC: U.S. Consumer Product Safety Commission.

U.S. Architectural and Transportation Barriers Compliance Board, Recreation Access Advisory Committee. (1994). *Recommendations for Accessibility Guidelines: Recreational Facilities and Outdoor Developed Areas*. Washington, DC: U.S. Government Printing Office.

U.S. Consumer Product Safety Commission. (1981). *Handbook for Public Playground Safety*. Washington, DC: U.S. Government Printing Office.

U.S. Consumer Product Safety Commission. (1991, 1994, 1997). *Handbook for Public Playground Safety*. Washington, DC: U.S. Government Printing Office.

U.S. Consumer Product Safety Commission. (1990). *Playground Surfacing: Technical Information Guide*. Washington, DC: U.S. Government Printing Office.

U.S. Consumer Product Safety Commission. (1996). *Staff Recommendations for Identifying and Controlling Lead Paint on Public Playground Equipment*. Washington, DC: U.S. Government Printing Office.

U.S. Consumer Product Safety Commission, Bureau of Epidemiology. (1979). *Hazard Analysis of Playground Equipment*. Washington, DC: U.S. Government Printing Office.

U.S. Consumer Product Safety Commission, Division of Human Factors. (1978). *Human Factors Analyses of Injuries Associated with Public Playground Equipment*. Washington, DC: U.S. Government Printing Office.

Wallach, F. *Comparison: US CPSC 1991 Handbook for Public Playground Safety and ASTM F1487-93 Standard Safety Performance Specification for Playground Equipment for Public Use*. New York: Total Recreation Management Services, Inc.

Wood, B., Fise, M. E. & Morrison, M. (1994). *Playing it Safe: A Second Nationwide Safety Survey of Public Playgrounds*. Washington, DC: U. S. Public Interest Research Group (PIRG) and Consumer Federation of America (CFA).

Section 9

PLAYGROUND SAFETY RESOURCES

Consumer Federation of America

1424 16th Street, N.W., Suite 604
Washington, DC 20036
202-387-6121
www.consumerfed.org

Non-profit federation of 240 pro-consumer organizations. Several playground reports are available.

- *Report and Model Law on Public Play Areas and Equipment*. (1998). Cost: $40
- *Report and Model Law on Public Play Areas and Equipment*. (1996). Cost: $30
- *Report and Model Law on Public Play Areas and Equipment*. (1992). Cost: $20.
- *Parent Checklist*. (1998). Free with self-addressed stamped envelope. Send request to: CFA Public Playground Checklist, PO Box 12099, Washington, DC 20005-0999.
- *Playing it Safe: A Fourth Nationwide Safety Survey of Public Playgrounds* (1998). Cost: $20
- *Playing it Safe: A Third Nationwide Safety Survey of Public Playgrounds* (1996). Cost: $15
- *Playing it Safe: A Second Nationwide Safety Survey of Public Playgrounds* (1994). Cost: $15.
- *Playing it Safe: A Nationwide Safety Survey of Public Playgrounds* (1992). Cost: $15.
- *Home Play Equipment: Safety Tips for Buying and Using* (1998). Free with self-addressed stamped envelope. Send request to: CFA Home Play Equipment Tips, PO Box 12099, Washington, DC 20005-0999.
- *Playground Safety: A Parents' Guide* (1998).

U. S. Consumer Product Safety Commission

Office of Information and Public Affairs
Washington, DC 20207
800-638-CPSC
www.cpsc.gov

Federal government agency. Call or write for a free copy of the current CPSC handbook and other publications, or visit CPSC's website to download information.

- *Handbook for Public Playground Safety* (Publication No. 325).
- *Tips for Public Playground Safety* (Publication No. 324).
- *Public Playground Safety Checklist* (Publication No. 327).
- *Ten Steps Toward a Safer Playground.*
- *Home Playground Safety Tips* (Publication No. 323).
- *Staff Recommendations for Identifying and Controlling Lead Paint on Public Playground Equipment.*
- CPSC Safety Alerts and Notices of Recalls.

ASTM

100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
610-832-9500

Private membership organization that develops voluntary industry standards. Two standards addressing public playgrounds and one addressing home playground equipment are available.

- *ASTM F1487-95: Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.* Cost: $26.
- *ASTM F1292-93: Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.* Cost: $18.
- *ASTM F1148-93: Standard Consumer Safety Performance Specification for Home Playground Equipment*. Cost: $21.

National Recreation and Parks Association

22377 Belmont Ridge Road
Ashburn, VA 21048
703-858-0784; Fax: 703-858-0794
www.nrpa.org

Membership organization which operates an information resource department, publishes a journal, holds an annual conference, and sponsors the National Playground Safety Institute. Many playground references and resources available. Call for a current catalog. Some examples are:

- *Playground Safety: Proceedings of the 1995 International Conference* (M. Christiansen, Ed., 1995). Cost: $35, members; $50, nonmembers.
- *Points about Playgrounds* (M. Christiansen, Ed., 1995). Cost: $35, members; $50, nonmembers.
- *Play it Safe: An Anthology of Playground Safety* (M. Christiansen, Ed., 1996). Cost: $35, members; $50, nonmembers.
- *Playground Safety is No Accident: Developing a Public Playground Safety and Maintenance Program* (K. Kutska and K. Hoffman, 1992). Cost: $35, members; $50, nonmembers. Cost with video: $65, members; $95, nonmembers.
- *State Regulations Focused on Playgrounds and Supervision* (F. Wallach, Ed., 1992). Cost: $24.50, members; $35, nonmembers.
- *Playground Equipment for Public Use: Continuum of Skills and Size Differences of Children Age Two to Twelve*. Cost: $17.50, members; $25, nonmembers.
- *Inspecting Playgrounds for Hazards* (Video and accompanying materials developed by The Information Exchange). Cost: $136.45.
- *Safe Active Play* (Video). Cost: $49.00, members; $65.00, nonmembers.
- *Safety First Checklist: Audit and Inspection Program for Children's Play Areas* (S. McIntyre & S. Goltsman). Cost: $39.95.
- *ASTM F1487-95: Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.* Cost: $17.50, members; $25, ASTM retail.
- CPSC Entrapment Test Probes and Protrusion Test Gauges. Cost: $54.95, members; $69.95, nonmembers.

The National Program for Playground Safety
School of Health, Physical Education & Leisure Services
University of Northern Iowa
Cedar Falls, IA 50614-0161
319-273-2416; 800-554-PLAY; Fax: 319-273-5833
www.uni.edu/playground
Funded by a grant for the Center for Disease Controls, this program was established in 1995 to create a national plan for the prevention of playground injuries, including development of a national clearinghouse of playground safety materials and a hotline about playground injury prevention. The program's homepage on the World Wide Web provides user-friendly access to extensive information ranging from injury statistics to playground safety checklists to current playground safety news.

U.S. Architectural and Transportation Barriers Compliance Board
1331 F Street, NW
Washington, DC 20004-1111
202-272-5434
www.access-board.gov/rules/playfac.htm
This federal agency, also referred to as the Access Board, is charged with developing accessibility guidelines and overseeing compliance with the Americans with Disabilities Act (the ADA). A Federal Recreation Access Advisory Committee published a report that includes draft accessibility guidelines for playgrounds and other outdoor areas: *Recommendations for Accessibility Guidelines: Recreational Facilities and Outdoor Developed Areas* (Publication S26). Call to obtain a free copy of the report; or order it by FAX at 202-272-5447. Also, for more information on the activities of this committee, you can contact Peggy Greenwell at the above phone number.

APPENDIX A

CPSC Safety Alerts

CPSC Notices of Recalls

Consumer Product SAFETY ALERT

FROM THE U.S. CONSUMER PRODUCT SAFETY COMMISSION, WASHINGTON, D.C. 20207

Prevent Burns on Hot Metal Playground Equipment

The U.S. Consumer Product Safety Commission (CPSC) advises parents to check for hot surfaces on metal playground equipment before allowing young children to play on it. Solid steel decks, slides, or steps in direct sunlight may reach temperatures high enough to cause serious contact burn injuries in a matter of seconds.

CPSC knows of incidents in which children suffered second and third degree burns to their hands, legs, and buttocks when they sat on metal stairs, decks, or slides. Young children are most at risk because, unlike older children who react quickly by pulling away their hands or by getting off a hot surface, very young children may remain in place when they contact a hot surface.

Parents should check for hot surfaces on metal playground equipment before allowing young children to play on it.

009203

Consumer Product SAFETY ALERT

FROM THE U.S. CONSUMER PRODUCT SAFETY COMMISSION, WASHINGTON, D.C. 20207

Strings Can Strangle Children On Playground Equipment

Clothing strings, loose clothing, and stringed items placed around the neck can catch on playground equipment and strangle children.

The U.S. Consumer Product Safety Commission has received reports of deaths when these items became caught on playground equipment, especially slides and swings. Items included strings on clothing (such as hoods and attached mittens), loose clothing (such as scarves and ponchos), and other items (such as jump ropes) placed around the neck. These items caught on protrusions, open-ended hooks, gaps, and other parts of playground equipment.

Avoid dressing children in loose or stringed clothing if they will be on playground equipment.

⚠WARNING

Clothing strings, loose clothing, and stringed items placed around the neck can strangle a child.

Never dress a child in loose or stringed clothing if they will be on playground equipment.

009109

Consumer Product SAFETY ALERT

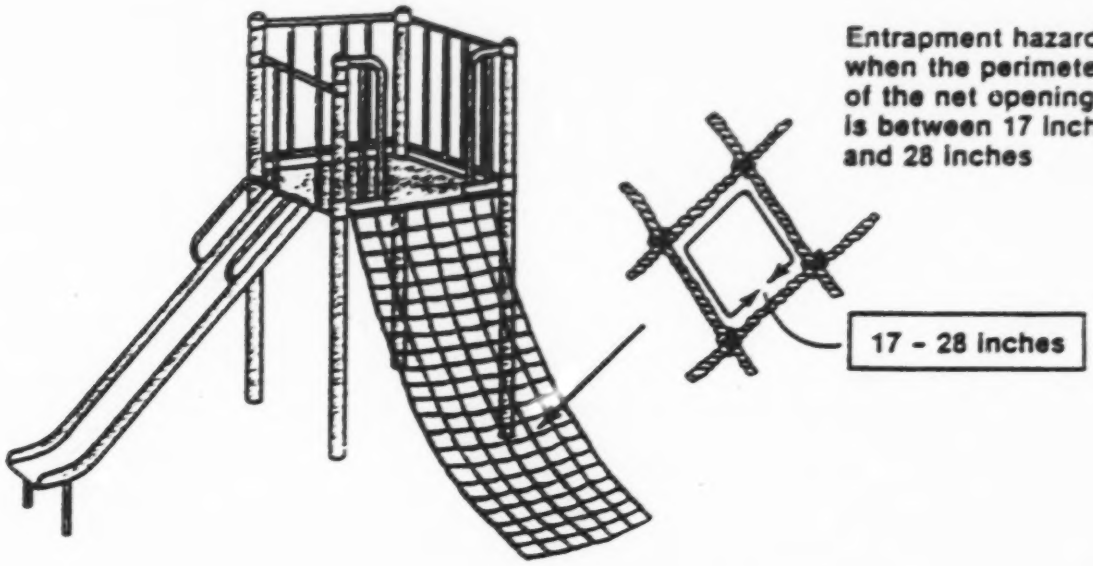
FROM THE U.S. CONSUMER PRODUCT SAFETY COMMISSION, WASHINGTON, D.C. 20207

Strangulation Hazard with Playground Cargo Nets

The U.S. Consumer Product Safety Commission (CPSC) advises parents to check outdoor play equipment with cargo nets before allowing children to climb them. Nets having openings with a perimeter length (sum of the length of the four sides) of between 17 and 28 inches could allow head entrapment resulting in strangulation.

CPSC knows of incidents at fast food restaurants where a child's head was entrapped and an adult had to cut the net to release the child. Although no serious injuries occurred, the potential for strangulation exists. CPSC staff are working with firms to correct any cargo nets which may be potentially hazardous.

Consumers who know of playground cargo nets that could cause head entrapment should stop children from climbing on the net and should call the CPSC toll-free hotline at 1-800-638-2772 to report the location and brand of the cargo net.



Parents should check for playground cargo nets that could allow head entrapment and strangulation. Net openings should either be too small to permit entry of a child's body or large enough to permit free passage of a child's head.

009208

BEST COPY AVAILABLE

NEWS from CPSC

U.S. CONSUMER PRODUCT SAFETY COMMISSION
OFFICE OF INFORMATION AND PUBLIC AFFAIRS WASHINGTON, D.C. 20207

FOR IMMEDIATE RELEASE
January 12, 1995
Release # 95-059

CONTACT: Elaine Tyrrell
(301) 504-0580 Ext. 1191

CPSC AND MANUFACTURERS ALERT PLAYGROUNDS TO REMOVE ANIMAL SWINGS

Washington, D.C.—The U.S. Consumer Product Safety Commission (CPSC) and a group of seven playground equipment manufacturers together have launched an effort to get potentially dangerous, heavy metal and molded plastic "animal" swings removed from playgrounds. The swings, which were installed from 1951 to 1991, were involved in the 1985 death of a 2-year-old in California and the 1994 death of a 6-year-old in Pennsylvania. These children were struck on the head as they walked near the swings.

CPSC also has reports of 42 children who suffered head injuries after being struck by these swings. The injuries included skull fractures, concussion and brain damage, serious lacerations and contusions, and one child who lost sight in an eye.

About 10,000 of the 30 to 80-pound swings were installed at parks, schools, and daycare centers nationwide. An undetermined number are still in use. The swings, which are made of cast aluminum or molded plastic, are painted to look like horses, zebras, pelicans, ducks, turtles, seals, rockets, and other figures. They were manufactured by BCI Burke, Blue Valley Industries, Game Time, Miracle Recreation Equipment Company, PCA, Playworld Systems, Quality Industries, and a number of companies that are no longer in business. BCI Burke's lightweight "Hobby Horse" swings are not included in this removal effort.

The following seven manufacturers of the heavy animal swings are each offering incentive plans to parks, schools and daycare centers to replace the swings:

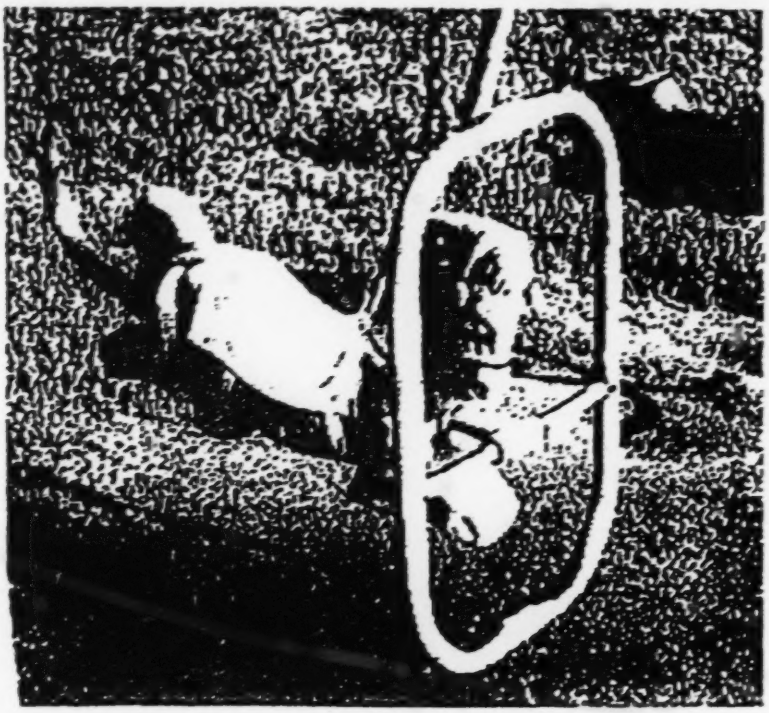
1) BCI Burke, Fond du Lac, Wis.	800-356-2070
2) Blue Valley Industries, Mexico, Penn.	717-436-8266
3) Game Time, Fort Payne, Ala.	800-377-2561
4) Miracle Recreation Equipment Company, Monett, Mo.	800-523-4202
5) PCA, St. Louis, Mo.	800-727-8180
6) Playworld Systems, New Berlin, Penn.	800-233-8404
7) Quality Industries, Hillsdale, Mich.	800-766-9458

-more-

BEST COPY AVAILABLE

Consumers who know of playgrounds with these animal swings should call their local school boards or park offices and the swing manufacturers for immediate removal of the swings.

The National School Supply and Equipment Association (NSSEA) is assisting CPSC and the seven manufacturers in this effort. Together, they will contact school boards, parks, and daycare centers across the country to urge immediate removal of these animal swings.



The U.S. Consumer Product Safety Commission protects the public from the unreasonable risk of injury or death from 15,000 types of consumer products under the agency's jurisdiction. To report a dangerous product or a product-related injury and for information on CPSC's fax-on-demand service, call CPSC's hotline at (800) 638-2772 or CPSC's teletypewriter at (800) 638-8270. To order a press release through fax-on-demand, call (301) 504-0051 from the handset of your fax machine and enter the release number. Consumers can obtain this release and recall information via Internet gopher services at cpsc.gov or report product hazards to info@cpsc.gov.

####

BEST COPY AVAILABLE

APPENDIX B

CFA Parent Checklist

CFA PARENT CHECKLIST

How Safe is Your Local Playground?

Too many children suffer injuries on public playground equipment. It is estimated that nearly 150,000 children are treated in hospital emergency departments annually for injuries sustained while playing on public playground equipment. And sometimes these injuries are fatal; at least 15 children die each year because of playground-related incidents.

Extensive research has been conducted to identify the playground hazards which cause injuries and death. The following checklist can be used to evaluate the general safety of your local playground. Check the playgrounds where your children play -- including the equipment at your local schools, parks, community centers, churches, and child care centers -- to see whether they present dangerous hazards.

1. **Is there a lack of protective surfacing under or around play equipment?**

   Protective surfacing is the most critical safety factor on playgrounds because approximately 75% of all injuries are caused by falls.

   Hard, paved surfaces such as concrete and asphalt as well as earth surfaces such as grass, soil, and hard packed dirt are not acceptable for use under and around play equipment. None of these surfaces provides adequate protection against fall-related injuries. Falls onto concrete or asphalt from as low as 2 inches can cause life-threatening head impact injuries.

   Acceptable protective surfacing materials include:
   - Loose-fill surfacing materials -- such as wood chips, shredded bark mulch, sand, and pea gravel -- when installed and maintained at depths of at least 9 to 12 inches and provided that they are not wet or compacted.
   - Unitary synthetic surfacing materials -- including some premolded rubber tiles and pour-in-place systems.

2. **Are pieces of play equipment too close together?**
   Is there a lack of protective surfacing where children might fall?

   A fall zone is the area under and around a piece of play equipment where a child might fall. The fall zone should have protective surfacing and be free of other equipment or obstacles onto which a child might fall.
   - If two pieces of adjacent stationary play equipment are no more than 30 inches in height, their fall zones may overlap with a minimum distance between structures of 6 feet. If adjacent equipment is higher than 30 inches, the minimum distance between structures should be 9 feet.
   - For climbing equipment, merry-go-rounds, seesaws, and spring rockers, the fall zone should extend a minimum of 6 feet in all directions from the perimeter of the equipment.
   - For slides, the fall zone behind the access ladder and to the sides of a slide should extend a minimum of 6 feet from the perimeter of the equipment. The fall zone in front of the exit of a slide should extend a minimum distance of 6 feet from the end of the slide chute or for a distance of H+4 feet, whichever is greater. H is the height of the slide platform.
   - For swings with conventional seats, the fall zone should extend a minimum of 6 feet from the perimeter of the support structure on each side as well as a minimum distance of twice the height of the pivot point in front of and behind the swing seats. The fall zone on the sides of a swing structure may overlap with that of an adjacent swing structure. But the fall zone in front of and behind the swings may not overlap with any other fall zone.

3. **Is there any equipment too high above ground?**

   The highest climbing rung or platform on climbing equipment or the height of the top of a slide, for example, should not exceed:
   - 4 feet above the protective surfacing when designed for preschool-age children.
   - 6 feet above the protective surfacing when designed for school-age children.

4. **Do elevated play surfaces -- such as platforms, bridges, walkways, and ramps -- lack adequate guardrails or protective barriers to prevent falls? Can children inadvertently fall off high elevated surfaces?**

5. **Are swings too heavy, too close together, or too close to support structures?**

- Swing seats should not be made of wood, metal, or any other heavy, rigid materials. Heavy, hard hitting swings -- including animal swings, multiple occupancy swings such as gliders (but not tire swings), swinging exercise rings, and trapeze bars -- may cause life-threatening head impact injuries.
- No swing structures should be attached to other play equipment or composite structures.
- No more than two swing seats should be suspended in the same section of the support structure.
- Infant/tot seats should not be suspended in the same of a swing structure as regular swing seats.
- Swings with conventional seats or tot seats should have horizontal clearances of at least 24 inches between adjacent seats and 30 inches between the swing seat and an adjacent structural component.

6. **Does the play equipment have any head entrapment hazards?**

Any opening -- except those where the ground is the lower boundary -- with an interior dimension between 3.5 and 9 inches may cause head entrapment, and such incidents can result in strangulation. Entrapment may occur when a child enters an opening, either head first or feet first, but cannot withdraw his or her head because the opening is too small.

7. **Does the play equipment have any entanglement hazards on which children may catch clothing or anything else around their neck?**

Entanglement incidents can result in strangulation.

- Look for open "S" hooks, especially on swings.
- Look for gaps, openings, holes, protrusions, or equipment components which may act as hooks or catch points, especially at the top of slides.

8. **Does the play equipment have any sharp points, corners, or edges?**

9. **Does the play equipment have any hardware or components which are dangerous protrusions or projections?**

10. **Does the play equipment have any exposed moving parts or other junctures which create dangerous pinch, crush, or shearing points?**

11. **Does the play equipment or area have any exposed concrete footings or environmental obstacles, such as rocks or roots, which create trip hazards and may cause impact injuries?**

12. **Does the play equipment show any signs of deterioration or corrosion?**
Does the play area lack maintenance or appear to have been vandalized?

- Look for loose splinters, large splits, and decay on wood components, rust or paint that is peeling, chipping, or cracking on metal components, and splitting or cracking on plastic components.
- Look for missing or damaged equipment components, checking items such as handholds, guardrails, swing seats, and benches.
- Special attention is warranted for deterioration and corrosion on structural components where they contact the ground; look for any emerging anchoring problems that may cause instability.

If the answer to any of the questions above is yes, contact the owner or operator of the playground -- such as the school principal, the local Parks and Recreation Department, or the child care provider. Let them know that you found hazards and that their play equipment and playground are not safe. Share the results of this survey and demand that corrective action be taken immediately so that children do not get hurt. Hazardous equipment should be upgraded or removed. Most importantly, ensure that adequate protective surfacing gets installed and maintained.

A more detailed evaluation of the playground's safety can be completed using Consumer Federation of America's 1998 *Report and Model Law on Public Play Areas and Equipment*. For a copy of this report, send a check or money order for $40 to Consumer Federation of America, 1424 16th Street, NW, Suite 604, Washington, DC 20036.

© 1998 Consumer Federation of America